PB86-172566

Superfund Record of Decision (EPA Region 3)
Moyer Landfill Site
Collegeville, Pennsylvania, September 1985

(U.S.) Environmental Protection Agency
Washington, DC

30 Sep 85

U.S. Department of Commerce
National Technical Information Service
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EPA/ROD/R03-85/018
September 1985

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EPA

Superfund Record of Decision:

Moyer Landfill, PA

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15. SUPPLEMENTARY NOTES

16. ABSTRACT

The Moyer Landfill is an inactive privately owned landfill located in Lower Providence Township in Montgomery County, Pennsylvania. The site was operated as a municipal landfill from the 1940's until April 1981, during which time it received municipal refuse and sewage sludges. According to local Federal Bureau of Investigation (FBI) officials, the landfill accepted a variety of solid and liquid hazardous wastes, including polychlorinated biphenyls (PCBs), solvents, paints, low-level radioactive wastes, and incinerated materials in bulk form and/or containerized in drums. In 1972, when the Pennsylvania Dept. of Environmental Resources (PADER) rules and regulations became more restrictive, this landfill was cited, and finally in 1981,it was closed and brought into receivership of the U.S. District Court.

The selected remedial action for this site includes: interim soil clay capping, composed of a material having a permeability of $10^{-4}/10^{-5}$ cm/sec to a depth of 36"; erosion and sedimentation control measures; surface water diversion; leachate collection, treatment and discharge; extraction, scrubbing and upgrading methane gas for delivery to the Philadelphia Electric Company (PECO); security/fencing measures; ground water monitoring; and all closure activities in compliance with RCRA at the conclusion of the gas generation phase (10 to 20 years). Total capital cost for the selected remedial alternative is estimated to be $6,298,500 with O&M costs approximately $332,000 per
(see separate page)

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Moyer Landfill, PA Contaminated Media: gw, sw Key contaminants: heavy metals, VOCs, toluene, trichloroethylene (TCE), arsenic, xylene, radioactive materials		

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Abstract
Continued

year. This alternative contemplates broad remedial work and its implementation will depend upon the success of the gas generation/recovery program and the contributions from generators and other potentially responsible parties (PRPs).

If negotiations with the PRPs fail and/or the methane gas alternative fails, EPA and PADER recommend: miscellaneous work preparatory to installation of a RCRA cap (grading, flattening of steep slopes, retaining walls and installation of rip-rap at areas that are most likely to be eroded); gas venting and monitoring; surface water collection and discharge to Skippack Creek; leachate collection and treatment that will meet the 10^{-6} risk level in the ground water and discharge requirements in the stream; ground and surface water monitoring; and maintenance of the cap. Total capital cost for this alternate remedial action is estimated to be $15,384,800 with O&M costs of $343,100 per year.

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RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

Site: Moyer Landfill Site, Collegeville, Pennsylvania

Data Reviewed:

The following documents describe the analysis of cost-effectiveness and feasibility of remedial alternatives for the Moyer Landfill Site. I have been briefed by my staff on their contents, and they form the principal basis for my decision. Unless otherwise specified, the underlying technical information is included in these reports:

- "Remedial Investigation Report", (Draft), Moyer Landfill Site, Collegeville, Pennsylvania, (IMS Engineers, July 1985)

- "Feasibility Study Report", (Draft) Moyer Landfill Site, Collegeville, Pennsylvania, (IMS Engineers, July 1985)

- "Work Plan", Remedial Investigation/Feasibility Study of Alternatives, Moyer Landfill Site, (NUS Corp. September 1983)

- "Remedial Action Master Plan", Moyer Landfill Site, (NUS Corp. September 1983)

- Summary of Remedial Alternative Selection.

- Recommendations by the Pennsylvania Department of Environmental Resources.

- Notes and outlines provided by the site receiver.

- Staff summaries and recommendations, including these attached.

Description of the Selected Remedy:

After careful review and consideration of site areas identified in the Remedial Investigation which warrant remedial action, and of all alternatives developed by EPA in the Feasibility Study and the alternative developed by the site receiver in the Addendum to the Feasibility Study, the site receiver's methane gas generation/recovery alternative can be implemented at the Moyer Landfill Site. This phased alternative will meet the Superfund goals of minimizing present and future migration of hazardous substances and protect human health and the environment, while also attaining all applicable and relevant Federal public health and environmental standards, guidances and advisories at the point of closure (10 to 20 years).

Specifically this option proposes:

- Soil cover with a permeability of $10^{-4}/10^{-5}$ cm/sec
- Erosion and sedimentation control measures
- Surface water diversion
- Leachate collection, treatment and discharge
- Methane gas recovery and sale
- Security/fencing measures
- Ground water monitoring
- All closure activities in compliance with RCRA at the conclusion of gas generation phase (10 to 20 years).

This alternative contemplates broad remedial work and its implementation will depend upon the success of the gas generation/recovery program and the contributions from generators and other potentially responsible parties (PRPs). If negotiations with the PRPs fail and/or the methane gas alternative fails, EPA and PADER recommend Remedial Action Alternative 4.2. This alternative is the cost-effective remedy and will satisfy as well all of the contamination and migration objectives identified in the Remedial Investigation.

Specifically this option proposes:

- Miscellaneous work preparatory to installations of RCRA cap: grading, flattening of steep slopes, retaining walls and installations of rip-rap at areas that are most likely to be eroded.

- Gas venting and gas monitoring.

- Surface water collection and discharge to Skippack Creek.

- Leachate collection and treatment that will meet the 10^{-6} risk level in the ground water and discharge requirements in the stream.

- Operation and Maintenance: ground and surface water monitoring, maintenance of the cap and treatment of leachate.

Declarations

Consistent with the Comprehensive Environmental Response and Compensation and Liability Act of 1980 (CERCLA) (42 U.S.C §9601-9657) and the National Contingency Plan (40 C.F.R. Part 300), and §101 (24) of CERCLA, I have determined that either of the remedial actions described above, together with proper operation and maintenance constitute remedies which mitigate and minimize damage to public health, welfare and the environment. The Pennsylvania Department of Environmental Resources has been consulted and agrees with the approved remedy. These activities will be considered part of the approved action and eligible for Trust Fund monies.

I have determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites.

9/30/85
Date

James M. Seif
Regional Administrator
EPA - Region III

Summary of Remedial Alternative Selection
Moyer Landfill Site

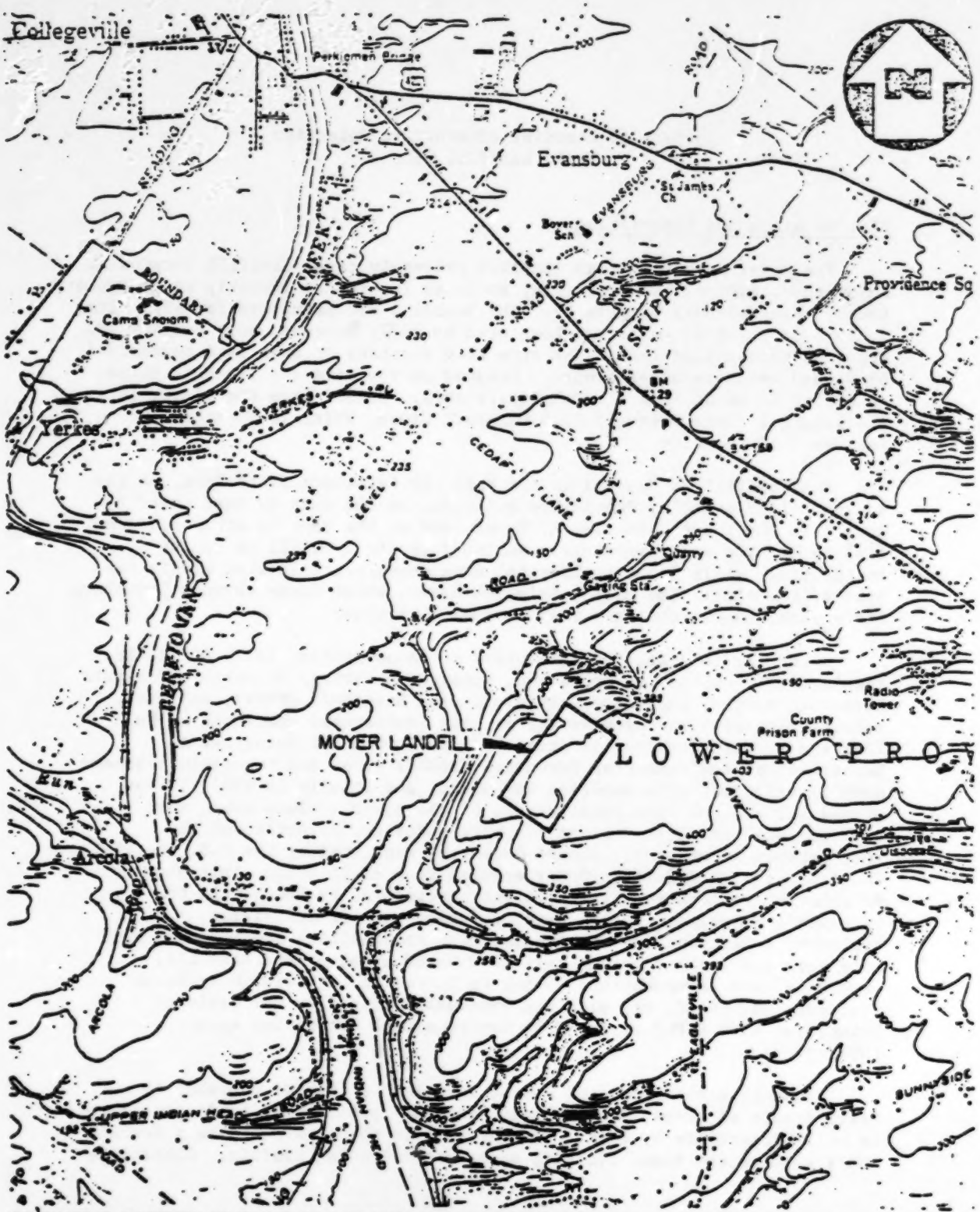
Site Location and Description

The Moyer Landfill is an inactive privately owned landfill located at Moyer Road, R.D. #2, Collegeville, in Lower Providence Township in Montgomery County, Pennsylvania (figure 1). The landfill was permitted for 65.5 acres in 1976 of which 45 acres had been used by 1977; however, some dumping did occur on unpermitted land. The site area consists of open land surrounded by wooded areas on steep slopes. Located on the site are leachate sumps, an office building, and a metal repair shed. Runoff from the slopes of the landfill flows westerly into Skippack Creek, which is located 350 feet west of the site.

The landfill is bounded on the north by Evansburg State Park, on the south by land owned by Providence Builders, on the east by land owned by Howard F. Moyer and Catherine M. Moyer, and on the west by other residential land. The area immediately surrounding the landfill is sparse residential, while large residential developments are located within one mile of the site. The nearby Skippack Creek, which flows through Evansburg State park, has in the past been stocked with trout.

According to local Federal Bureau of Investigation (FBI) Officials, the landfill, during its operation, accepted a variety of solid and liquid hazardous wastes, including polychlorinated biphenyls (PCBs), solvents, paints, low-level radioactive wastes, and incinerated materials in bulk form and/or containerized in drums. In 1972 when the Pennsylvania Department of Environmental Resources (PADER) rules and regulations became more restrictive, this landfill was cited, and finally in 1981, it was closed and brought into receivership of the court. Since then, some remedial work has been done at the site under the direction of the receivership attorney Ms. Joanne Denworth, appointed by the U.S. District Court under a 1982 Consent Order entered in a civil action initiated by neighboring residents. This work was carried out by SMC Martin the receiver's consultant. They have performed certain activities, i.e., design of collection systems and leachate treatability studies, and some site work including covering certain exposed areas of the landfill, regrading, and revegetation. Owing to increased involvement by local residents and PADER, the site was eventually listed on the National Priorities List (NPL) by the U.S. Environmental Protection Agency (USEPA).

Although access into and around the site is limited somewhat by a heavy growth of trees, steep slopes, streams, puddles and ponds, the site is still accessible by foot. The entrance to the site did have a fence and a gate at one time, limiting access to vehicular traffic. Elevations



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LOCATION MAP
MOYER LANDFILL SITE
COLLEGEVILLE, PA

Scale: 1" = 2000'

FIGURE 1

IMS
Engineers - Architects, P.C

range from 275 feet above mean sea level (MSL) along the west side of the site to 497 feet above MSL at the top of the landfill. Drainage from the site area flows westward into Skippack Creek through direct runoff and also via small streams located north, south, and southwest of the site. Skippack Creek drains southwest into Perkiomen Creek approximately 3,000 feet downstream from the site Skippack Creek is a recretional stream used for fishing. Skippack Creek is not used for municipal water supplies.

Ground water in the site area occurs in an aquifer which has poor water yields. The average depth of the wells in the area is 151 feet. Wells drilled into the deeper system are often artesian due to the dense, relatively impermeable layer of bedrock overlying the deep system.

Site History

The site had been operated as a municipal landfill from the 1940's until April 1981, during which time it received municipal refuse and sewage sludges.

In the early 1970's PADER developed and implemented more comprehensive landfill regulations. As a result, a leachate collection system was constructed and began operating in 1972 at the Moyer Landfill Site The collection system consisted of underground drain pipes placed on top of the bedrock at the toe of the landfill slopes. The leachate collected in these pipes drained by gravity to earthen basins, called "Lagoon No. 1" and Lagoon No. 2", from which the leachate was to be pumped. The concrete basins were later converted to function as pumping stations. After the pumps were installed, the usable storage volume in the lagoons was reduced to one or two feet because a certain amount of leachate had to remain in the lagoons to prevent the pumps from running dry. Subsequent testing by the PADER revealed that leachate - contaminated ground water was appearing as springs downgradient from the leachate collection pipe on the northwest side of the landfill. An additional pump station was then installed to intercept the springs and return this contaminated water to Lagoon No. 2. Several force mains connected the collection system pumping stations to a concrete basin (which has since been abandoned) at the top of the landfill. From this basin, leachate was applied to the top of the landfill and disposed of by spray irrigation.

Because of increasingly stringent environmental regulations promulgated by the State of Pennsylvania during the mid-1970's, the owners of the landfill were prohibited from filling beyond the original boundaries. The landfill owners then submitted an application to the PADER requesting permission to expand the landfill boundaries. The original landfill was for an estimated 5 acres. In the late 1970's, the landfill owners also submitted an application to the PADER for a major expansion to an area adjacent to the existing landfill, but this application was never approved by the PADER.

In the original fill area (39 acres), the waste was simply dumped, compacted, and covered with earth. In the new fill area, the plans called for installing an impermeable liner prior to filling. Site preparation work began on the new area in 1977. Landfilling was reportedly limited to this new lined area until the landfill was closed by a PADER order in early 1981.

The early analysis on leachate from the landfill dates back to February 1972 by Kappe Associates, done for the conventional parameters such as BOD, COD, and nitrogen. This analysis was conducted in order to design an aerated lagoon to treat the leachate.

Later, leachate from the landfill was sampled extensively by PADER and to a lesser extent by EPA and by Moyer's Landfill Inc., through Lancaster Labs and SMC Martin (PADER, April 3, 1980 to March 10, 1982; Austin, March 10, 1980; Bonder, October 3, 1980; SMC Martin, November 26, 1980). A wide range of heavy metals and organics were detected. In one situation sulfate concentration was found to be four times higher than USEPA Maximum Contaminant Level (MCL). The heavy metals are indicative of sludges, both sewage and industrial, known to have been disposed of on the site. The organics may have been components of certain industrial sludges (i.e. from the solvent recycling or plastics industries), but their probable origins cannot be determined at this time.

The USEPA detected several hazardous compounds in leachate emanating from the Moyer Landfill Site. These included benzene (2 to 4 ug/L), toluene (7 to 50 ug/L), trichloroethylene (9 to 20 ug/L), tetrachloroethylene (0.1 to 0.5 ug/L) and chlorobenzene (1 to 3 ug/L). Other compounds detected by the USEPA include ethylbenzene (2 to 20 ug/L), vinyl chloride (0.3 to 7 ug/L), methylene chloride (7 to 300 ug/L), chloroethane (0.7 to 2 ug/L), 1,1-dichloroethane (0.4 to 100 ug/L, and 1,1-dichloroethylene (1 to 2 ug/L). These volatile organics in the concentrated or pure forms are associated with industrial solvents.

From the point of view of conventional parameters such as BOD/COD, the leachate appears to be considerably lower than the leachate emanating from a typical landfill.

A detailed chronological profile of the development of activities and operations at the site is presented in Appendix A. The site is listed in Group 6 on the National Priorities List (NPL) of 418 sites, issued by the EPA in December 1982. A work plan was developed which identified the following data needs:

- To more fully delineate the extent and nature of ground water contamination at the site.
- To determine the extent and nature of surface soil contamination at particular locations.

- To evaluate ground water aquifer characteristics through pumping tests and to record water-level readings.

A remedial Investigation/Feasibility Study was funded at a total cost of $681,000 and field work began May, 1984.

Current Site Status

IMS Engineers conducted a soil and rock sampling, and monitoring well installation program at this site to define the geologic and hydrogeologic regime of the site and areas adjacent to the site. A total of thirteen monitoring wells have been installed. They consist of four clusters of two wells each, one (1) deep and one shallow, located within 5 to 10 feet from each other, and five additional wells which are interspersed around the boundary of the landfill site to give a broader perspective of the geology and hydrogeology of the site. The shallow wells are about 30 to 80 feet deep, and the deep wells are approximately 250 feet deep.

As indicated by the boring samples the Moyer Landfill is situated on a high, resistive ridge of shale, argillite and siltstone of the Lockatong Formation, of Triassic age (figure 2). At some of the boreholes, the rock is disintegrated up to a depth of 40 to 80 feet, beyond which the formation is very dense.

Permeability testing of wells has indicated the permeability of the upper bedrock above 100 feet is about 5×10^{-5} cm/sec while below 100 feet, the permeability decreases from 1×10^{-5} cm/sec to 5×10^{-7} cm/sec. Ground water movement from the vicinity of the landfill site is generally to the West with discharge around the toe of the fill and through seeps along the steep valley of Skippack Creek. Hydraulic monitoring has demonstrated that Skippack Creek is a hydraulic boundary and no flow of leachate crosses the creek.

It is calculated that 95 to 98 percent of the flow is lateral and in a downgradient direction from the landfill site while 2 to 5 percent is vertical into the less permeable deeper aquifer zone. The rate of flow of ground water through the fractures is in the range of 1 to 70 feet per day. Permeability measurements at the site confirms the other investigations. The rate of leachate generation has been estimated to be at an average rate of about 18,600 gallons per day. A leachate collection system installed by the owners is in a poor state of repair and is now inoperable. Depending upon the year, excess leachate is generated and discharges to the Skippack Creek system during a period of 5 to 8 months each year.

Data was obtained from analysis of samples taken on two separate occasions, May 21 thru June 1, 1984 and October 2 thru 12, 1984. Samples were collected from onsite monitor wells along with offsite monitor and

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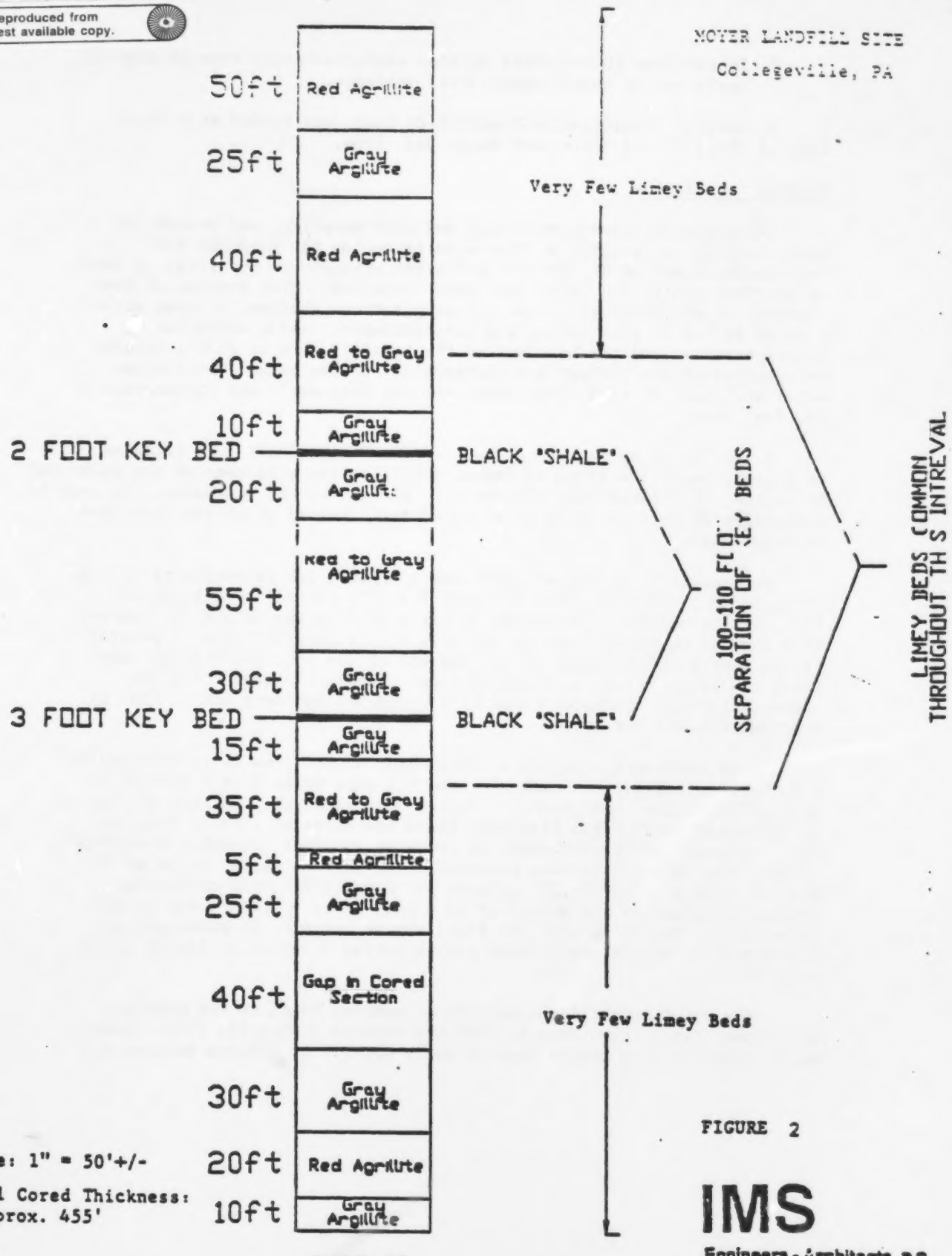
GENERALIZED GEOLOGIC STRATIGRAPHY

(Based on Subsurface Drilling Work)

MOYER LANDFILL SITE
Collegeville, PA

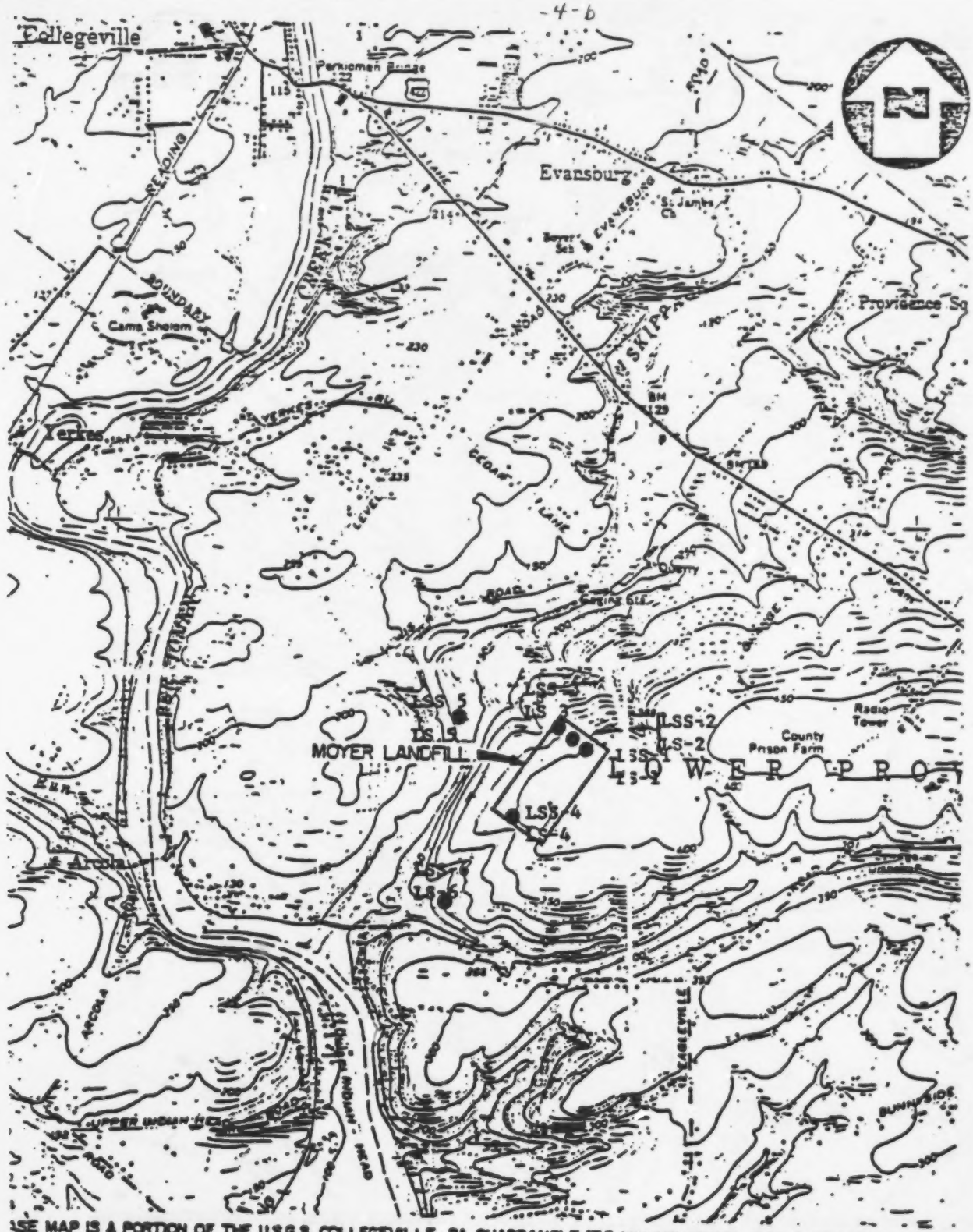


Scale: 1" = 50'+/-

Total Cored Thickness: approx. 455'

FIGURE 2

IMS
Engineers - Architects, P.C.



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ONTOUR INTERVAL 10'.

LEACHATE SAMPLE LOCATIONS
MOYER LANDFILL SITE
COLLEGEVILLE, PA

FIG. 3

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ROCHESTER, NEW YORK

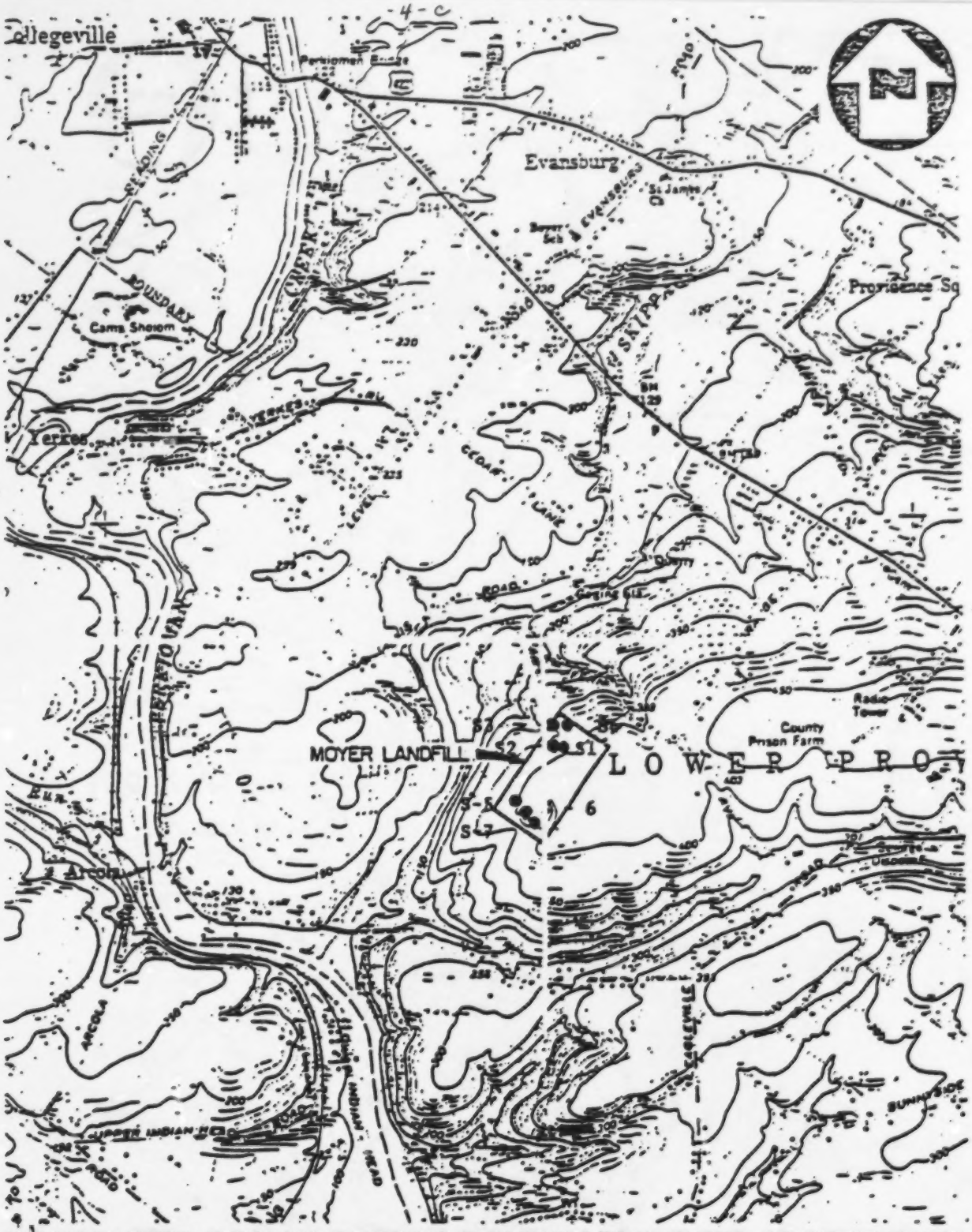

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FIGURE 4

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SEEPS LOCATIONS
MOYER LANDFILL SITE
COLLEGEVILLE, PA

IMS
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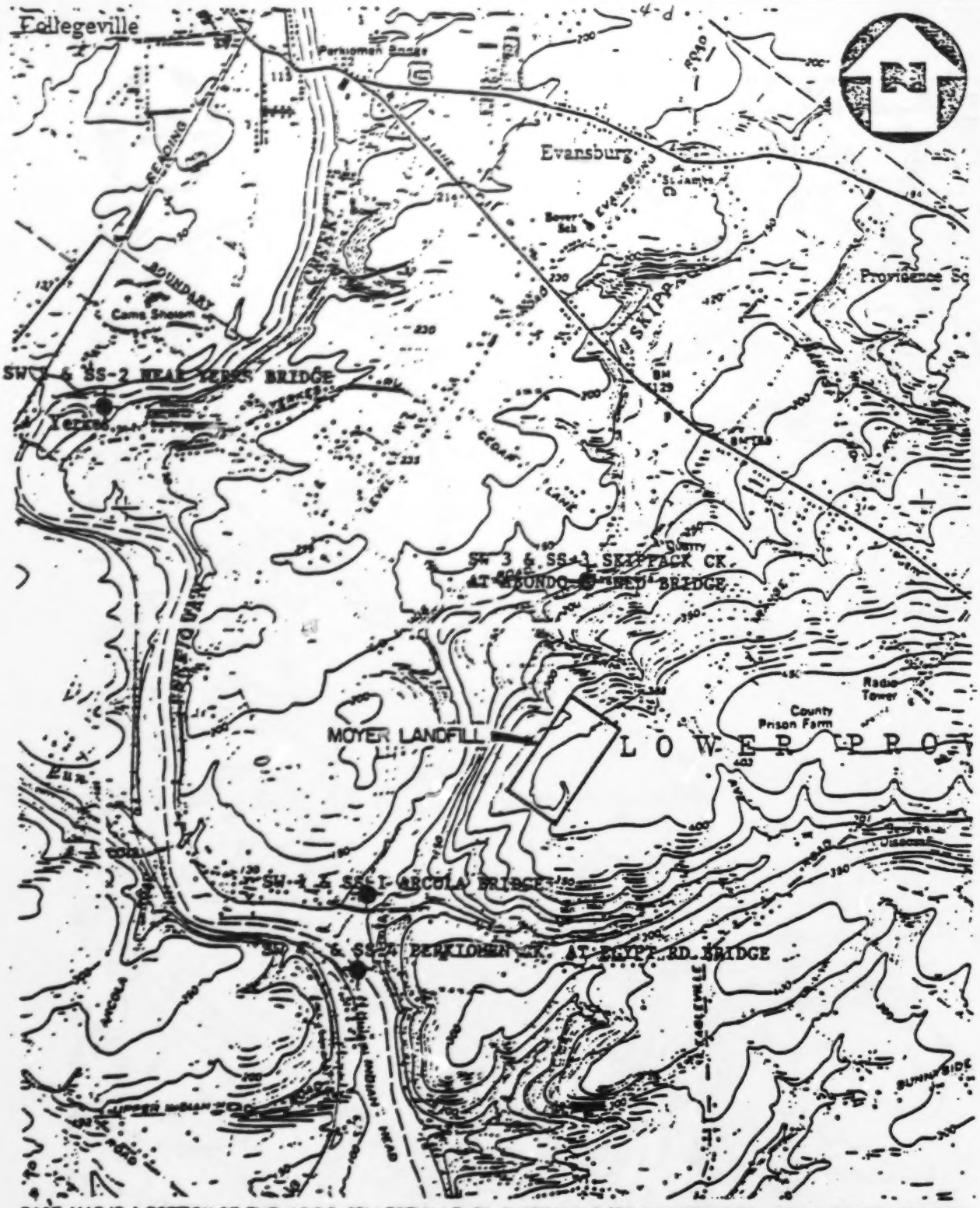
ROCHESTER, NEW YORK



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- FIGURE 7

CREEKS SAMPLE WATER
MOYER LANDFILL SITE
COLLEGEVILLE, PA

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ROCHESTER, NEW YORK

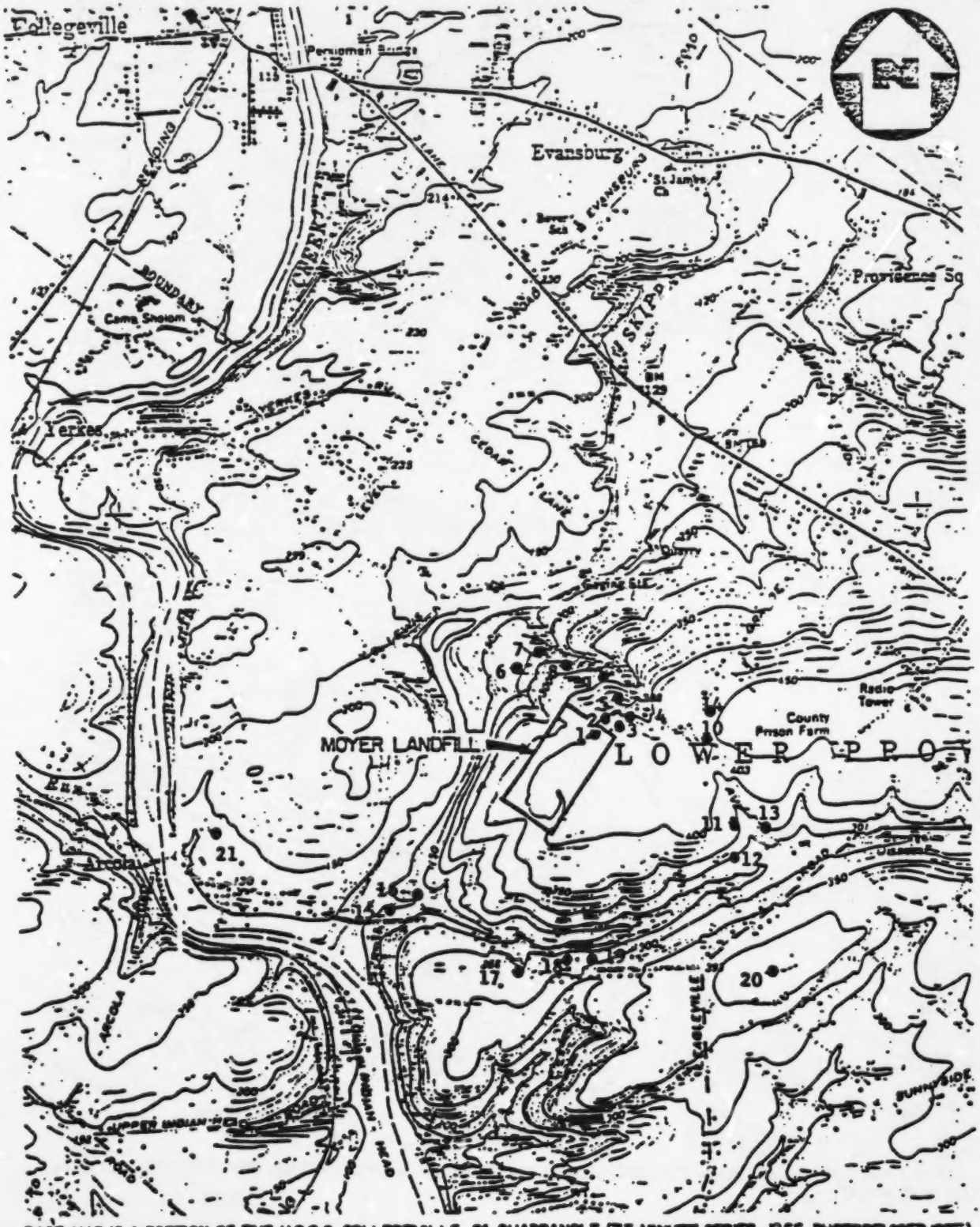

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FIGURE 6

MONITORED RESIDENTIAL WELLS
MOYER LANDFILL SITE
COLLEGEVILLE, PA

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FIGURE 5

MONITORING WELLS LOCATIONS
MOYER LANDFILL SITE
COLLEGEVILLE, PA

LEGENDS

- ● Shallow Wells
- □ Deep Wells

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domestic wells. Six leachate and six seep locations from the landfill site were sampled for water and/or sediment. Water sediments and fish samples were collected from upstream and downstream locations in Skippack Creek passing along its western boundary. Ground water samples from twenty-two residential wells and thirteen newly installed monitoring wells around the periphery of the site were sampled. These samples were analyzed for priority pollutants, PCBs, dioxins and radioactivity. The laboratory test results indicate that some contaminants observed in the leachate and seep samples from the landfill site are also present in water and sediment from the Skippack Creek, in the tissue of the fish sampled downstream of the landfill, and in monitoring wells surrounding the periphery of the landfill site.

The occurence, distribution and probably transport of the various chemicals is summarized below. This will be presented under three subheadings: Onsite Contamination, Offsite Contamination, and Contamination Transport.

ONSITE CONTAMINATION

Six (6) leachate (figure 3) and six (6) seep samples (figure 4) were collected. Leachate samples were analyzed for 129 priority pollutants. One additional leachate sample was analyzed for radioactivity. The seep samples were analyzed for pH conductivity, oxidation-reduction potential and temperature. The landfill surface shows a number of leachate and seep locations. These are supposedly discharging several of priority pollutants and Beta radionuclides into the surface water. Therefore, the landfill site is very unsafe for public trespass. It is a continous source of polluting ground and surface water with several priority pollutants and radiation of probably hospital origin. The following is a summary of contamination observed at the site:

- The samples are observed to be contaminated with 86 priority pollutants and 16 metals. Although the concentration of most of these contaminants is low, nearly all of them are contaminants (e.g., cyanide) of concern.

- At least four (4) of the priority metals: arsenic, barium, lead and zinc, and eight of the organic priority pollutants: trichloroethylene, toluene, xylene, di-N-octylphthalate, 2-hexanone, and 2-butanone, bis (2-ethylhexyl) phthalate are observed to be above ambient levels.

- Lead and barium exceed United States Public Health Service Drinking Water Standards.

- Beta Radiation (Technetium 99) is observed in the leachate sample and is above World Health Organization (WHO) Standards. This contamination is suspected to be of hospital origin.

- There is no evidence of any detectable level of air pollution.

OFFSITE CONTAMINATION

Thirteen monitoring wells (figure 5), twenty-two residential wells (figure 6) bordering the landfill site, Skippack Creek flowing by the western boundary of the landfill site, Perkiomen Creek accepting flow from Skippack Creek, and fish from Skippack Creek (figure 7) were sampled for priority pollutants, metals, organics, PCBs, dioxins, and Beta radiation. The following is a summary of the contamination observed off the Moyer Landfill Site.

- The residential wells bordering the landfill site do not show any detectable levels of organic or inorganic pollution. This water meets all Federal USEPA Drinking Water Standards and is, therefore, safe for human consumption.

- The Skippack Creek shows detectable levels of contamination. Those contaminants are: toluene, chloroform, 2-hexanone, bis (2-ethylhexyl) phthalate, di-N-octylphthalate, manganese, iron and possibly nickel. The concentrations of these contaminants are very low. However, these contaminants are present and their source can be traced back to the landfill. The creek water meets all Federal, USEPA, and State of Pennsylvania Drinking Water Standards and is therefore safe as a raw water supply source.

- The fish in the creek also show detectable levels of contamination. The contaminants observed were lead, O-xylene, 2-hexanone, TCE, 2-butanone, toluene, di-N-octylphthalate. Again, the concentrations of these contaminants are very low. None of these contaminants exceeds FDA standards of fish consumption of this fish by humans. The contaminants detected can be traced back to the landfill.

- The shallow monitoring wells installed around the periphery of the landfill site show substantial concentrations of some contaminants. These wells are located on the western boundary of the landfill site. The direction of ground water flow is also to the west, northwest, and southwest. These contaminants are arsenic, lead, barium, and nickel. The concentration of barium is 3,500 ug/l, whereas the USPHS standard is 1,000 ug/l. The concentration of lead observed is 230 ug/l, whereas USPHS is 50 ug/l. The USPHS is considering revising the standard for lead. This is expected to be more stringent than 50 ug/l. Both barium and lead are toxic to humans. The arsenic concentration observed is 25 ug/l, whereas the USPHS standard is 50 ug/l.

- Thirteen monitoring wells and one residential well were tested for radium 226, Gross Alpha and Gross Beta radiation. Monitoring wells MW 5, 8, and 10 contained Beta radiation varying from a 34.9±6 to 124±20.3 pCi/l. These three wells are shallow wells and are the most contaminated of the thirteen wells drilled at this site. The residential well water indicated very low levels of radiation including Beta radiation. The WHO guideline for Beta activity is 27 pCi/l.

Evidently the radiation activity in monitoring well water far exceeds the maximum recommended for drinking water. In order to make a proper health and environmental impact of this contaminant, it is essential to determine the exact nature of this contaminant at its isotope level and also possibly identify its source. For this purpose, samples from these wells were collected again. The Analytical test results are indicated in Tables 1 and 2.

- Potassium-40 is a naturally occuring isotope that may have been contributed by the large amount of suspended material present in the collected samples. The Technitium-99 may be attributed to hospital wastes buried at the site.

- The shallow ground water is also contaminated with several of the other organic contaminants found in the creek water, sediments, and fish. Therefore, the shallow ground water flowing west and northwest of the landfill site is substantially contaminated.

- The vegetation and trees on the western boundary of the landfill site show stress.

CONTAMINANT TRANSPORT

There are numerous seeps at the site that are either seeping lightly or leaching heavily contaminated water from the landfill. Eighty six organic priority pollutants and sixteen priority pollutant metals have been observed in the samples from the site. There are three mechanisms of transport of the contaminants from the site: air, surface water and ground water.

No detectable levels of contaminants are observed in the air at the site. Certain volatile contaminants such as toluene, xylene, and cyanide have been detected at the site, but have not been detected during air monitoring.

Table 1

RADIONUCLIDE - ANALYTICAL TEST DATA SUMMARY

MOYER LANDFILL SITE, COLLEGEVILLE, PA

Source \ Constituent →		226 RA	GROSS ALPHA		GROSS BETA	
		Concentration pCi/L	Concentration pCi/L	Detection Limit	Concentration pCi/L	Detection Limit
MONITORING WELL	# 1	0.5 ± 0.1	2.5 ± 2.5	1.545	19.2 ± 3.4	1.526
	# 10	0.4 ± 0.1	0.1 ± 3.3	3.429	34.9 ± 6.0	2.566
	# 11	2.7 ± 0.1	9.5 ± 4.2	1.686	11.4 ± 2.9	1.405
	# 12	0.2 ± 0.1	3.5 ± 1.3	1.144	2.9 ± 2.3	1.388
	# 13	0.5 ± 0.1	1.4 ± 2.3	1.572	-0.2 ± 2.5	1.653
	# 2	0.5 ± 0.1	2.3 ± 1.9	0.753	7.7 ± 2.3	1.435
	# 4	0.4 ± 0.1	0.8 ± 2.0	1.799	4.4 ± 3.3	1.899
	# 5	0.6 ± 0.1	8.2 ± 5.2	16.15	92.0 ± 17.6	6.398
	# 6	0.1 ± 0.1	1.6 ± 1.2	0.721	5.3 ± 3.0	1.703
	# 7	0.1 ± 0.1	2.5 ± 1.9	1.341	4.0 ± 2.7	1.573
	# 8	2.0 ± 0.1	6.5 ± 5.0	4.656	124.0 ± 20.3	8.462
	# 9	0 ± 0.1	-0.2 ± .7	1.519	3.0 ± 2.5	1.513
O'LEARY RES-WELL	# 4	0.2 ± 0.1	1.8 ± 1.8	0.629	3.9 ± 2.5	1.523

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TABLE 2

ADDITIONAL RADIATION ANALYSIS

MOYER LANDFILL SITE, COLLEGEVILLE, PA.

Sample Identification	Gross Beta	Gamma Spectrum Contaminant	pCi/liter
Monitoring Well, MW 5	26 ± 6	Potassium-40	27
		Radium-228	<1
		Strontium-90	1.9 ± 1.4
Monitoring Well, MW 8	37 ± 7	Potassium-40	31
		Radium-228	<1
		Strontium-90	<0.5
Monitoring Well, MW 10	32 ± 7	Potassium-40	29
		Radium-228	<1
		Strontium-90	<0.5
Leachate Water LS 2	199 ± 12	Potassium-40	167
		Radium-228	<1
		Strontium-90	<0.5
		Technetium-99	35 ± 15
Leachate Sediments, LSS 2	7.8 ± 0.6	Manganese-54	*0.07 ± 0.02
		Cesium-137	*0.09 ± 0.02
		Potassium-40	*5.66 ± 0.07
		Cadmium-109	*1.31 ± 0.35

*pCi/gm (dry)

The ground water level is lower than the bottom of the landfill. Therefore, ground water is not the direct vehicle of contaminant transport from the site. The transport of contamination is mostly due to surface water percolation through the landfill. The exposed contaminants at the site are transported directly to the surface water bodies (Skippack Creek and Perkiomen Creek) via surface runoff and indirectly through contaminated ground water (upper aquifer) discharging to the creeks. The lower aquifer is not contaminated. Beta Radiation and other contaminants observed in the monitoring wells (MW8 and MW4) are the result of the transport route. Beta radiation and other contaminants could also be transported directly via the surface water runoff from the site to the surface water bodies. However, observed concentrations in these receptors are low due to the enormous dilution effect in the creeks. The shallow monitoring wells on the western boundary of the landfill show this contamination. The majority of the pollutants (trichlorethethylene, toluene, xylene, 2-hexanone, 2-butanone, acetic acid methylester) observed in the monitoring wells and the surface water bodies have high Mobility Index and are consequently easily transported from the landfill site to these receptors.

Tables 3-5 summarize all critical contaminants associated with the Moyer Landfill.

ENDANGERMENT ASSESSMENT

The risk assessment for the Moyer Landfill Site is based on hydrogeological and chemical analytical data obtained during previous investigations and the RI conducted under this study. The objective of this assessment is to define the health risks associated with the presence of hazardous contaminants on and around the site and to define the potential environmental effects associated with the contaminants in site-specific circumstances. In order for a health risk to occur, contaminants having known chemical and biological toxic characteristics must be present, actual or potential exposure pathways must be present, and human environmental receptors must be located in the exposure paths.

Typically, the risk assessment procedures address the development of the details of the location and demographics of the receptor population and most sensitive environmental receivers. The risk assessment involves assessing the significant contaminant migration routes and exposure pathways, identifying the hazardous compounds of greatest concern, and evaluating the possible effects in the context of probable exposure scenarios.

The major potential contaminant transport path providing exposure of human receptors to the landfill contaminants is the ground water flow beneath the site. There are also several minor routes of transport of contaminants. Volatilization of organic and/or inorganic contaminants

TABLE 3

Critical Contaminants - Toxicological Data
(Chemical Toxicity Parameters)
Moyer Landfill Site, Collegeville, Pennsylvania

RANGE OF CONTAMINANT CONCENTRATION

Contaminant	Leachates Water ug/L	Leachates **Sediments ug/kg or mg/kg	Ground Water Res. Bolle ug/L	Ground Water Res. Bolle ug/L	Creek Sample Water ug/L	Creek Sample **Sediments ug/kg or mg/kg	Fish ** ug/kg or mg/kg
1. Arsenic	0-82	10-24	5-25	10-11		2-10	1.1
2. Barium	230-7210	49-261	50-3500	28-416	47-54	13-57	?
3. Lead	0-875	0-32	2.4-230	5-41		4.4-28	0-0.76
4. Manganese	512-54,000	630-2420	23-7160	5-818	18-53	64-420	.
5. Nickel	61-483	6.6-18	90-202	40	5-18	0-9.7	0-2
6. Zinc	24-2730	35-124	5-951	13-2070		11-62	6-14
7. Beta Radiation			33-144	*6.4			
8. Trichlorethylene (TCE)		6.3					0 7
9. Toluene	3-11				3		2 -27
10. Xylene	5-6	10-41				23	8 10
11. Di-N-Octylphthalate		14K			8		1-8-1760
12. 2-Hexanone	8-61				4	23	90
13. 2-Butanone	10-18	140-590					80
14. Bis (2-ethylhexyl) Phthalate	6-105	47-1165	39-160		274-562	120-895	2710-5280
15. Acetic Acid and Methylester		22-546				72-172	

Acute Toxicity mg/kg	Chronic Toxicity mg/day	Health Advisory Levels ug/L 1day	10day	chronic	Dermal Absorption and Toxicity
Oral man TDLo 7857 mg/kg/55Y. Intramuscular rat 20mg/kg					
Oral woman TDLo-450					
Inhalation man TCLo 2300 ug/m^3					
Intravenous muscular rat 50mg/kg					Human skin: 500mg/54hy mild
Human inhalation 124mg/m^3/50months					
Oral Rat LD_{50} 4920 Oral Human LDLo-7000	NR	2020	200	75	PAT
Oral Rat LD_{50}-5000	30	21,500	2,200	330	Slight penetration & Slight potency
Oral Rat LD_{50}-4300	160	12,000	1,300	620	PAT
Oral Man TDLo-143 Oral Rat LD_{50}-31,800	42				PAT
	NR		PAT		PAT

NR Not Recorded
* Only one residential well was tested for radiation
** Concentration in fish/sediments. It is in mg/kg for metals and ug/kg for organics.
K suspected concentration
L less than

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TABLE 4

Chemical Contaminants - Toxicological Data
(Environmental Parameters)
Moyer Landfill Site, Collegeville, Pennsylvania

	Contaminant	RANGE OF CONTAMINANT CONCENTRATION — Leachates: Water ug/L	Leachates: **Sediments ug/kg or mg/kg	Ground Water: Res. Well ug/L	Ground Water: Res. Well ug/L	Creek Sample: Water ug/L	Creek Sample: **Sediments ug/kg or mg/kg	Fish: ** ug/kg or mg/kg	PPCLS ug/L	Safe Drinking Water Act MCLS ug/L	Ambient Water Quality Criteria: Fish and Drinking Water ug/L	Ambient Water Quality Criteria: Drinking Water Only ug/L	Safe Drinking Water Act Health Advisories: 1day ug/L	Safe Drinking Water Act Health Advisories: 10day mg/L	Safe Drinking Water Act Health Advisories: chronic ug/L
1.	Arsenic	0-82	10-24	5-25	10-11		2-10	L1	(2.5mg/L)	50	0(2.2mg/L)		(2.5mg/L)		50
2.	Barium	238-7210	49-261	50-3500	28-46	47-54	13-57	2	1,000	1,000					
3.	Lead	0-875	0-32	2-4-230	5-41		4.4-28	0-.76	50	50	50	50			50
4.	Manganese	512-54,800	630-2420	23-7160	5-818	18-53	64-420	6		50		15.4			50
5.	Nickel	61-483	6.6-18	98-202	40	5-18	0-9.7	0-2	750		13.4				5,000
6.	Zinc	24-2730	35-124	5-931	13-2070		11-62	4-14		5,000					
7.	Beta Radiation			33-144	*6.4										
8.	Trichlorethylene		6.3					4.7	1.84		0,(2.7)	(2.8)	2.02	0.2	0.075
9.	Toluene	3-11				3		25-27	15,000		14,300	15,000	21.5	2.2	0.34
10.	Xylene	5-6	10-41				23	8-10					12.0	1.3	0.62
11.	Di-N-Octylphthalate		14K			8		188-1760							
12.	2-Hexanone	8-61				4	93	98							
13.	2-Butanone	10-18	140-590					80							
14.	Bis (2-ethylhexyl) Phthalate	6-105	47-1165	39-160		274-362	120-895	2700-5200	21,000						
15.	Acetic Acid and Methyl ester		22-546				72-172								

* Only one residential well was tested for radiation

** Concentration in fish/sediments. It is in mg/kg for metals and ug/kg for organics.

K suspected concentration

L less than

TABLE 5

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Critical Co[illegible]tituents - Mobility Indexes

Moyer Landfill Si[illegible], Colleyville, Pennsylvania

RANGE OF CONTAMINENT CONCENTRATION

Contaminant	Leachate		Ground Water		Creek Sample		Fish	Vapor Pressure at 20°C mmHg	Solubility in Water at 20°C (mg/l)	Specific Gravity @20°C	Soil Aquasp. Partit. Coeff. (KOC)	Water Partit. Coeff. KOW	Mobility Index
	Water ug/L	**Sediment ug/kg or mg/kg	Res. Wells ug/L	Res. Wells ug/L	Water ug/L	**Sediments ug/kg or mg/kg	** ug/kg or mg/kg						
1. Arsenic	0-82	10-24	5-25	10-11		2-10	L1						
2. Barium	238-7210	49-261	50-3500	28-416	47-[illegible]	13-57	2						
3. Lead	0-875	0-32	2.4-230	5-41		4.4-28	0-.76						
4. Manganese	512-54,800	630-2420	23-7160	5-818	18-[illegible]	64-420	6						
5. Nickel	61-483	6.6-18	98-202	40	5-1[illegible]	0-9.7	0-2						
6. Zinc	24-2730	35-124	5-931	13-2070		11-62	4-14						
7. Beta Radiation			33-144	*6.4									
8. Trichlorethylene		6.3					4.7	60	1,100	1.46	120	191	2.7
9. Toluene	3-11				3		25-27	22	520	0.867	590	491	1.5
10. Xylene	5-6	10-41				23	8-10	5	180	0.88	760	1,480	0.08
11. DI-N-Octylphthalate		14K			8		188-1760	1.2[t]	0.285	0.99	49,695	8.06×10^4	L-10
12. 2-Hexanone	8-61				4	23	98	2	35,000	0.83	13.8	0.368	3.7
13. 2-Butenone	10-18	140-590					80	24	125,000	0.808	6.85	0.182	5.64
14. Bis (2-ethylhexyl) Phthalate	0-[illegible]03	47-1165	39-160		274-[illegible]62	120-895	2700-5280	10.01	0.4	0.99	41,000	5.4×10^8	-7
15. Acetic Acid and Methylester		22-546				72-172		28	252,63	1.049	16.5	0.512	4.49

* Only one residential well was tested for radiation

** Concentration in fish/sediments. It is in mg/kg for metals and ug/kg for organics.

t This vapor pressure is at 200°C

K suspected concentration

L less than

to ambient air, with the contaminated air moving offsite, has not been observed at the Moyer Landfill Site. Surface water runoff mixed with contaminated leachates emanating from the deposited wastes at Skippack Creek, may affect the environment and surface waters of Skippack Creek, and, consequently, may have a possible impact on the human health and aquatic environment.

Potential receptors include nearby users of ground water for drinking and all other purposes, persons using local surface waters for recreational purposes, food grown in nearby fields, and persons eating grazing animals fed from nearby fields. They include consuming milk of animals fed from nearby fields, consuming aquatic biota in affected surface water, terrestrial fauna using affected aquatic animals as a food source, vegetation that may be stressed, and onsite remediation workers. Although the residential wells adjoining the Moyer Landfill Site were not contaminated at the time of sampling, the monitoring wells on the western boundary of the landfill site did show contamination from high levels of lead, barium, and arsenic. Beta radiation is also suspected at the landfill. There are no nearby residential wells in the direct path of leachate flow, which use water for drinking or any other purposes.

Individuals at risk for exposure due to Beta radiation and other organic and inorganic contaminants would include remedial construction workers or persons trespassing the site, who may encounter the compounds emanating from the seeps or leachate streams. However, this exposure to contaminants would present concentrations in the environment of brief duration. Ingestion of low doses of Beta radiation (Technitium - 99) could be avoided by proper health and safety provisions for the workers operating at the site.

ALTERNATIVES EVALUATION

Table 6 presents a brief comparison of all alternatives included in this document. The major objectives for remedial action to be taken at the Moyer Landfill site are to mitigate or eliminate environmental contamination through collecting and treating leachate from the landfill and capping the site to control leachate generation and soil erosion.

The overall strategy is to mitigate and minimize harm to the public health and the environment. This should include minimizing further upper aquifer contamination and the possibility of direct contact with the waste. Leachate control is an integral part of the overall scheme in order to eliminate the continuing migration of contaminants across the site and off the site to the Skippack Creek. Implementation of these measures will benefit both the health of the local residents, as well as the environment. Contamination of the food chain will be eliminated by both the prevention of contact with the waste areas as well as the prevention of leachate migration into the local water courses.

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TABLE 6

SUMMARY OF REMEDIAL MEASURES AND DEVELOPMENT OF 2ED REMEDIAL ACTION ALTERNATIVES

MOYER LANDFILL SITE
COLLEGEVILLE, PENNSYLVANIA

			Meets CERCLA Goals	Meets All Standards	Exceeds All Standards	Monitoring	Surface Water Collection And Discharge	Cap	Bottom Layer (First Layer)	Second Layer	Third Layer	Fourth Layer	Fifth Layer	Top Layer	Leachate Collection	Leachate Treatment	Gas Venting/ Use
*50	Receiver's Remedial Action Alternative (See Attached)		Yes/No	Yes/No	No	No	Yes	Soil	Soil Thickness 36" (10^{-} cm./sec.)	No	No	No	No	Yes	Yes	Yes	No
I	RAA1	No Action Monitoring	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No
II	RAA2-A	Soil Cover with surface water collection and discharge, leachate collection and treatment, and long-term ground and surface water monitoring	Yes/No	No	No	Yes	Yes	Soil	42" Natural Soil (10^{-4}/10^{-5} cm./sec.	No	No	No	No	6" Top Soil	Yes	Yes	No
	RAA2-1	RAA2 provisions; Leachate collection up to 0-30 ft. depth and treatment at Moyer Landfill Site	Yes/No	No	No	Yes	Yes	Soil	42" Natural Soil (10^{-4}/10^{-5} cm./sec.	No	No	No	No	6" Top Soil	Yes	Yes	No
	RAA2-2	RAA2 provisions; leachate collection up to 0-60 ft. depth and treatment at Moyer Landfill Site	Yes	No	No	Yes	Yes	Soil	42" Natural Soil (10^{-4}/10^{-5} cm./sec.	No	No	No	No	6" Top Soil	Yes	Yes	No
	RAA2-3	RAA2 provisions; Leachate collection up to 0-30 ft. depth and treatment at Jake Treatment Plant	Yes/No	Yes	No	Yes	Yes	Soil	42" Natural Soil (10^{-4}/10^{-5} cm./sec.)	No	No	No	No	6" Top Soil	Yes	Yes	No
	RAA2-4	RAA2 provisions; Leachate collection up to 0-60 ft. depth and treatment at Jake Treatment Plant	Yes	Yes	No	Yes	Yes	Soil	42" Natural Soil (10^{-4}/10^{-5} cm./sec.)	No	No	No	No	6" Top Soil	Yes	Yes	No
	RAA2-5	RAA2 provisions; Leachate collection up to 0-30 ft. depth and treatment at Valley Forge Plant	Yes/No	Yes/No	No	Yes	Yes	Soil	42" Natural Soil (10^{-4}/10^{-5} cm./sec.)	No	No	No	No	6" Top Soil	Yes	Yes	No
	RAA2-6	RAA2 provisions; Leachate collection up to 0-60 ft. depth and treatment at Valley Forge Plant	Yes	Yes	No	Yes	Yes	Soil	42" Natural Soil (10^{-4}/10^{-5} cm./sec.)	No	No	No	No	6" Top Soil	Yes	Yes	No
III	RAA3	Soil and Clay (RCRA) Cap with surface water collection and discharge to Skippack Creek, long-term ground and surface water monitoring, gas venting	Yes	Yes	No	Yes	Yes*	RCRA	24" 10^{-7} cm/sec compacted clay	30 mil synthetic membrane	12", 10^{-3} cm/sec Drainage Layer	Geo-Textile	42" Natural Soil	6" Top Soil	No	No	Yes

-9-a

TABLE 6 (Contd.)

INTERIM REMEDIAL MEASURE AND DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

MOYER LANDFILL SITE
COLLEGEVILLE, PENNSYLVANIA

	Remedial Action Alternative		Meets CERCLA Goals	Meets All Standards	Exceeds All Standards	Monitoring	Surface Water Collection and Discharge	Cap	Bottom Layer (First Layer)	Second Layer	Third Layer	Fourth Layer	Fifth Layer	Top Layer	Leachate Collection	Leachate Treatment	Gas Venting
IV	RAA4	Cap Exceeding All Standards. Surface water collection and discharge, leachate collection and treatment, longterm ground and surface water monitoring and gas venting	yes	Yes	Yes	Yes	Yes	RCRA	24", 10^{-7} cm/sec compact clay	50 mil synthetic membrane	12", 10^{-3} cm/sec Drainage Layer	Geo-Textile	42" Natural Soil	6inch Top Layer	Yes	Yes	Yes
	RAA4-1	RAA4 provisions. Leachate collection up to 0-30 ft. and treatment at Moyer Landfill Site	Yes	Yes	Yes	Yes	Yes	RCRA	24", 10^{-7}cm/sec compact clay	50 mil synthetic membrane	12" 10^{-3}cm/sec Drainage Layer	Geo-Textile	42" Natural Soil	6 inch Top Layer	Yes	Yes	Yes
	RAA4-2	RAA4 provisions. Leachate collection up to 0-60 ft. and treatment at Moyer Landfill Site	Yes	Yes	Yes	Yes	Yes	RCRA	24", 10^{-7}cm/sec compact clay	50 mil synthetic membrane	12", 10^{-3} cm/sec Drainage Layer	Geo-Textile	42" Natural Soil	6 inch Top Layer	Yes	Yes	Yes
	RAA4-3	RAA4 provisions. Leachate collection up to 0-30 ft. and treatment at Oaks Treatment Plant	Yes	Yes	Yes	Yes	Yes	RCRA	24", 10^{-7}cm/sec compact clay	50 mil synthetic membrane	12", 10^{-3}cm/sec Drainage Layer	Geo-Textile	42" Natural Soil	6 inch Top Layer	Yes	Yes	Yes
	RAA4-4	RAA4 provisions. Leachate collection up to 0-60 ft. and treatment at Oaks Treatment Plant	Yes	Yes	Yes	Yes	Yes	RCRA	24", 10^{-7}cm/sec compact clay	50 mil synthetic membrane	12", 10^{-3}cm/sec Drainage Layer	Geo-Textile	42" Natural Soil	6 inch Top Layer	Yes	Yes	Yes
	RAA4-5	RAA4 provisions. Leachate collection up to 0-30 ft. and treatment at Valley Forge Sewage Plant	Yes	Yes	Yes	Yes	Yes	RCRA	24", 10^{-7}cm/sec compact clay	50 mil synthetic membrane	12", 10^{-3}cm/sec Drainage Layer	Geo-Textile	42" Natural Soil	6 inch Top Layer	Yes	Yes	Yes
	RAA4-6	RAA4 provisions. Leachate collection up to 0-60 ft. and treatment at Valley Forge Sewage Plant	Yes	Yes	Yes	Yes	Yes	RCRA	24", 10^{-7}cm/sec compact clay	50 mil synthetic membrane	12", 10^{-3}cm/sec Drainage Layer	Geo-Textile	42" Natural Soil	6 inch Top Layer	Yes	Yes	Yes
V	RAA5	New RCRA Landfill Exhumation and transfer to RCRA approved Landfill Contiguous to Moyer Landfill Site.	Yes	Yes	Yes	Yes	Yes	RCRA	Meets or exceeds all RCRA requirements								

-9-b

a/"Short-term" work is for five years and "Long-term" work is for thirty years. All Operation and Maintenance work is proposed for thirty years except groundwater and surface water monitoring program and leachate collection and treatment which shall be conducted for thirty years for RAA1 and RAA2, and five years for the other three alternatives (RAA3, RAA4 and RAA5).

SW - Surface Water

The NCP specifies that remedial alternatives should be classified either as source control (40 C.F.R. 300.68(e)(2)) or offsite (management of migration) remedial actions (40 C.F.R. 300.68(e)(3)). Source control remedial actions address situations in which hazardous substances remain at or near the areas in which they were originally located and are not adequately contained to prevent migration into the environment. Offsite remedial actions address situations in which the hazardous substances have migrated from their original locations. Alternatives developed may fall solely in either classification or may involve a combination of source control and management of migration measures, as determined by the specific site problems addressed.

In an effort to determine remedial alternatives for the subject site, feasible technologies were identified for consideration in each response action. Available technologies were then screened to eliminate all but the most definitive and implementable alternatives. This screening included: technical (site conditions or wastes characteristics), environmental and public health, institutional, performance and cost criteria.

Certain response actions and technologies were not associated with any specific remedial objective or feasible technology for this site. These technologies and response actions and the rationale for not including them are listed on Table 7. Further detail of this initial screening is included in Section 12 of the Remedial Investigation/Feasibility Study.

Those technlogies which passed the technology screening process were used to form remedial alternatives. Remedial alternatives were developed using best engineering judgement to select a technology or groups of technologies that best address the problems existing at the site to protect public health and the environment.

In order to study a wide range of responses at this site, at least one alternative has been proposed and developed in each of the five categories suggested in US EPA Guidance Document for Feasibility Studies Under CERCLA. Also, the Receiver Remedial Action Alternative (RRAA) suggested and prepared by the receiver attorney for the Moyer Landfill Site, is included. A brief description of the RRAA and those of the five categories is given as follows.

- Receiver Remedial Action Alternative

  The receiver proposes to meet all applicable standards by the implementation of a closure plan that includes among other things collection and treatment of leachate, soil cap, security measures and a methane gas system. It is indicated that the revenues available to the receiver shall be used to remediate the site. The Receiver's RRAA is presented in Section 13.1 of the RI/FS as such without any comments.

TABLE 7

Rationale for Eliminating
Various Technologies

Response Action	Rationale for Elimination
1. Alternative Water Supply	No Residential Wells Contaminated
2. Ground Water Barriers	Not Feasible
3. Ground Water Collection	Not Feasible
4. Source Reduction	Impossible to Identify "Hot Spots"
5. Incineration	Incineration Period Estimated to be about 30 Years, Very Expensive Inadequate Cleanup

- No action: No-action alternatives could include monitoring activities.

- Alternatives that meet the CERCLA goals of preventing or minimizing present or future migration of hazardous substances and protecting human health and the environment, but do not attain all of the applicable or relevant standards (This category may include an alternative that closely aproaches but does not meet the level of protection provided by the applicable or relevant standards).

- Alternatives that meet the CERCLA goals and attain all applicable or relevant federal public health or environmental standards, guidance, or advisories.

- Alternatives that exceed all applicable or relevant federal public health and environmental standards, guidance, and advisories.

- Alternatives specifying offsite storage, destruction, treatment, or secure disposal of hazardous substances at a facility approved under the Resource Conservation and Recovery Act (RCRA). Such a facility must also be in compliance with all other applicable EPA standards.

The evaluation criteria selected were: technical feasibility, public health, environment, institutional evaluation, land cost effectiveness. Particular emphasis was placed on:

- Technical Feasibility
- Performance
- Implementability
- Reliability

- Public Health Evaluation
  - Reduction of Health Impacts

- Environmental Evaluation
  - Reduction of Environmental Impacts
  - Protection of Natural Resources

- Institutional Evaluation
  - Legal Requirements, Institutional Requirements
  - Community Impacts

- Cost Effectiveness
  - Capital Costs
  - Operation and Maintenance Costs
  - Present Worth Values
  - Sensitivity Analyses

Technologies remaining after the initial screening were combined in logical groups called components in order to fit into the five different categories mentioned above. These components were then combined to form various remedial alternatives.

Description of Remedial Alternatives

Receiver's Remedial Action Alternative (RRAA)

The Receiver's Remedial Action Alternative (RRAA) is intended to accomplish the closure of the facility using best engineering judgement to select technologies to address problems at the site consistent with requirements and objectives outline in the National Contingency Plan (NCP). In particular, the program is designed to avoid significant adverse environmental impacts, while at the same time providing adequate control to keep chemicals onsite or to prevent their offsite migration at levels having a detrimental and adverse effect under minimal circumstances of threat or harm to public health, welfare or the environment.

In this connection, the RRAA takes into consideration:

1. the extent to which chemicals are a danger to public health, welfare or the environment.

2. the extent of chemical migration.

3. previous experience in similar situations, and

4. environmental effects and welfare concerns.

The RRAA can be classified as a phased source control remedial action.

The RRAA provides for an interim soil clay cap as indicated under the section entitled "Soil Cap" composed of a material having a permeability of $10^{-4}/10^{-5}$ to a depth of 36" which will substantially reduce rain water infiltration into the landfill site. Also provided will be surface water collection and discharge to the Skippack Creek, long term ground water and surface water monitoring, collection and treatment of residual leachate, extraction, scrubbing and upgrading of methane gas for delivery to the Philadelphia Electric Company (PECO) instead of gas venting to the atmosphere.

The provision of the interim soil clay cap will partially reduce the problem of erosion of existing cover material and minimize transmission of contaminated material from the landfill site. It will also partially reduce the generation of rain induced leachate by decreasing rain water infiltration into the landfill.

The leachate collection and treatment system proposed in the RRAA are designed to intercept leachate for the entire periphery of the landfill. The leachate collected will be treated at a plant constructed as the site with the effluent subject to a NPDES permit discharged to the Skippack Creek. After completion of methane gas collection, the site will be closed in compliance with RCRA standards.

Ground water monitoring, storm water management and erosion and sediment control together with site security as proposed by the Receiver are intended to meet all requirements applicable to the site.

Methane Gas Recovery

Information supplied by the EPA and independent measurements at the site indicate that solid waste tonnage present may range from 4 million tons of useable wastes up to 5.8 millions tons. Of these tonnages, significant amounts are belived to be composed of sewage sludges and other similar wastes rich in gas production potential.

Assuming that 4 million tons of solid waste are present at the site, Mandeville & Associates (M&A) estimates that approximately 1.5 million cubic feet per day of raw landfill gas can be generated for a period of close to a decade. Additional tonnages, not accounted for, could permit the production of greater amounts of landfill gas.

The 1.5 million cubic feet of gas per day is estimated to have a methane content of 58%, and, after processing, approximately 625,000 cubic feet to 700,000 cubic feet of pipeline standard gas per day could be available for introduction into the PECO pipeline. Such production numbers would be dependent upon various contingencies including:

1. Confirmation of gas availability from the landfill.

2. The usage of available methane gas to run the facility, and

3. Efficiency of the gas separation system.

At present, M&A is considering producing a high Btu gas (950 Btu's per standard cubic foot) comparable to processed natural gas for sale to PECO through the use of Monsanto PRISM gas separators. These separators incorporate proven technology to upgrade and "clean" the methane gas extracted from the site in order to produce pipeline quality gas. Additional processing steps may be required in the event that trace elements of certain hazardous materials are found in the gas.

The system will include, among other things, construction of a system of gas collection wells together tied into a common manifold, gas compressor, membrane separators (the Monsanto PRISM separators), gas monitoring system, gas pre-treater, control building, pipeline to PECO, gas measuring equipment, and fencing security system.

Current capital for the proposed gas facility is $2,873,000, including special contingencies relating to gas production at a superfund hazardous waste site.

Projected annual operating and maintenance costs attributable to the gas processing facility are anticipated to be $332,000, a certain portion of which are attributable to operations at a site containing hazardous waste.

Test wells drilled by SMC Martin at the site in 1983 provided certain data concerning contaminants in the gas other than CO_2. Although the gas appears "clean", the gas generated at the Moyer Landfill may contain trace amounts of toxic volatiles. To the extent that additional contaminants are found, it will be feasible to install gas pre-treatment (carbon bed) equipment to assure the delivery of gas to the pipeline meeting PECO specifications. These contaminants will be treated.

A complete description is enclosed in the draft Addendum to the Remedial Investigation/Feasibility Study.

Summary of RRAA

The RRAA defines the full scope of remedial work to be performed in the immediate future. It contemplates broad remedial work and its implementation will depend upon the success of the gas generation/recovery program and the contributions from generators and other potentially responsible parties (PRPs). The gases generated at the Moyer Landfill site are most likely to contain trace amounts of toxic volatiles and gases; volatiles if any, will be properly treated. The economic viability and public acceptability of the gas recovery program is a proven concept in present practice in other parts of the U.S. As proposed, this program will meet the NCP criteria of a corrective action planned for a hazardous waste site. The contamination at Moyer Landfill site requires remediation to mitigate the public health and environmental concerns; the gas recovery program and leachate collection system will address and remediate the concerns. After completion of methane gas collection, the site will be closed in compliance with RCRA standards.

The following remedial alternatives and sub-alternatives below have been prepared by IMS Engineers for the EPA. A detailed description and evaluation of each alternative are presented as follows:

A. No Action Alternative

Alternative No. 1 - No Action with Monitoring

Under the no action alternative, additional remedial activities would not be performed. However, a long-term monitoring program would be established to provide information on contaminant concentration remaining and extent of potential migration. The monitoring program would include ground water, surface water, sediment sampling, and respective analysis.

The Remedial Investigative work confirmed the presence of heavy metals and the organic contaminants of concern in the monitoring wells, creek waters, leachate samples, sediments and fish. Some of these contaminants are arsenic, barium, lead, nickel, zinc, trichloroethylene (TCE), toluene, xylene, di-n-octylphthlate, 2-hexanone and 2-butanone methylethyl ketone (MEK). Besides, the shallow aquifer on the west and southwest of the Moyer Landfill exhibits contamination with Beta radionuclides, lead, and barium. Therefore, the no-action-monitoring program should include analysis for all contaminants. Since fractures in the geologic formations can provide a pathway for migration of contaminants into the lower aquifer, it is necessary to monitor the ground water. The lower aquifer was not found to be contaminated. Monitor wells constructed during the RI phase of this study could be used for monitoring migrating contaminants downgradient from the site.

Surface waters are potential receptors for leachate that seeps from the deposited wastes. Also the shallow (upper aquifer) ground water has a potential for contaminating nearby surface waters. These surface waters may be used for bathing, irrigation, lawn watering and recreational uses as well as providing a habitat for aquatic organisms. Under these circumstances, the sampling stations should include the creek, some selected residential wells and monitoring wells constructed during the RI phase of the study.

Notwithstanding that the RI study showed none of the residential wells were contaminated, monitoring of selected residential wells is vital since the water is being used for human consumption. The residential wells recommended for monitoring are 1, 6, 7, 11, 16 and 19 as shown in figure 6. Due to seasonal variations, sampling and analyses should be conducted at least once every three months. For costing purposes, it is assumed that this program would be continued for 30 years.

This alternative will not reduce or eliminate any of the impacts resulting from the landfill. It will be effective in providing information about the movement of the contaminants, so that, if necessary, future remedial actions could be taken. The site would continue to be a source of contamination. This landfill will continue to produce leachate that will cause ground water to continue to exceed 10^{-6} risk levels offsite. The possibility of the public coming into direct contact with the hazardous substances or leachate would remain. Contamination of nearby surface waters would continue as leachate flows unchecked offsite. There would be no capital costs for this alternative.

B. <u>Alternatives that meet the objectives of CERCLA (RAA2)</u>

Alternative No. 2 - Soil Cover with Surface Water Collection and Discharge, Long-Term Leachate Collection and Treatment and Long-Term Ground Water Surface Water Monitoring.

This alternative proposes to collect surface water from the landfill site and proposes to discharge to the Skippack Creek. It proposes to collect leachate up to 0-30 feet depth for the entire periphery of the landfill. These vary from a minimum of 5 feet depth on the Northeast boundary to a maximum of 30 feet depth on the western boundary of the landfill site. It is presumed that up to 50% of leachate generated might be intercepted by this alternative. In order to assure a much better interception of leachate (80%), it is proposed to intercept leachate up to 60 feet depth from the western boundary of the landfill site. The depths of interception of leachate on the other parts of the boundary of the landfill stay the same. The leachate collected could be treated at a plant constructed at the Moyer Landfill Site and the effluent discharge to Skippack Creek. As an alternative, the leachate could be transported to Oaks Sewage Plant or the Valley Forge Sewage Plant for treatment and discharged along with the plant effluent for the purposes of evaluation of this alternative and more specifically development of costs.

Remedial Action Alternative 2 will be sub-divided as follows:

RAA2.1 Leachate collection up to a maximum of 0-30 feet and leachate treatment at Moyer Landfill Site.

- Soil cover, 4 feet thick (including top soil for vegetation)
- Surface water collection and discharge to Skippack Creek
- Leachate collection at depths up to a maximum of 30 feet
- Leachate treatment at onsite treatment plant

RAA2.2 Leachate collection up to a maximum depth of 0-60 feet and leachate treatment at Moyer Landfill Site.

- Soil cover, 4 feet thick (including top soil for vegetation)
- Surface water collection and discharge to Skippack Creek
- Leachate collection up to a maximum of 60 feet
- Leachate treatment at onsite treatment plant

RAA2.3

- All items similar to RAA2.1, except that leachate is collected, transported and treated at Oaks Sewage Treatment Plant.

RAA2.4

- All items similar to RAA2.2 except that leachate is collected, transported and treated at Oaks Sewage Treatment Plant.

RAA2.5

- All items similar to RAA2.1 except that leachate is collected, transported and treated at Valley Forge Sewage Treatment Plant.

RAA2.6

- All items similar to RAA2.2 except that leachate is collected, transported and treated at Valley Forge Sewage Treatment Plant.

Soil cover has been demonstrated to be a fairly effective method of excluding a substantial portion of rainwater from the wastes that are being covered with soil. The expected useful life of the cover system proposed herein is unlimited if the soil cover is properly maintained. This can be accomplished by filling in natural soil for any settlements caused in the line and grade of the cover. Also proposed unit processes for treatment of leachates are conventional technologies and are known to perform adequately.

Percolation of precipitation into the fill and into the waste would be reduced by the proposed soil cover; however, leachate will continue to be generated. The leachate collection and treatment will considerably reduce the ground water contamination. Therefore the ecological receptors will have reduced exposure to the contaminants. It is assumed that a larger percentage of the leachate will be collected by using this alternative; however, if meticulous maintenance is not carried out periodically, there is always the possibility that cracks may occur during the summer months and the leachate may eventually bleed out. Also this alternative does not take care of the leachate that might percolate below the depths the leachate is intercepted. Even though it can be argued that the contribution will be only miminal, this alternative does not resolve the ground water contamination completely. Emissions and discharges from the leachate treatment process units should not adversely affect the environment or ecological receptors if their operation meets regulatory permit levels.

This alternative provides a distinct improvement in the protection of ground water and surface water receptors compared to RAA1 (Remedial Action Alternative 1). The RCRA requirements stipulate provision of a soil cover that should be less permeable than the bottom of the landfill. From this standpoint, this alternative does not comply with the current RCRA requirements. However, this alternative does reduce the contamination of ground water which is a major CERCLA requirement. The discharge requirement levels will be met by way of leachate treatment.

The capital costs of construction, annual operation and maintenance costs, present-worth of operations and maintenance costs for 30 years and the total present-worth cost are presented in detail in the RI/FS. These costs estimates incoprorated the sensitivity analysis for those items of work, the costs of which are likely to vary during implementation of this alternative. Depending upon the sub-alternative, the capital costs of construction vary from $10,557,500 to $23,881,500, the annual operation and maintenance costs from $254,300 to $327,000, and the total present-worth costs including present-worth costs for operation and maintenance for 30 years, varies from $13,085,000 to $26,812,100.

C. Alternatives that Satisfy All Applicable Standards (RAA3)

RCRA Cap with Surface Water Collection and Discharge to Skippack Creek, Gas Venting and Short-term Ground Water and Surface Water Monitoring.

This alternative provides for a RCRA cap to essentially eliminate the rainwater infiltrating into the landfill site. It also provides surface water collection and discharge to Skippack Creek, short-term ground water and surface water monitoring, and gas venting to the atmosphere. This alternative does not provide for collection and treatment of residual leachate that will be trapped once this RCRA cap is installed. Provision of this cap will stop the problem of erosion of existing cover material and minimize transmission of contaminated material from the landfill site. Compared to RAA2, this alternative will substantially reduce the generation of the rain-induced leachate by preventing rainwater infiltration into the landfill.

The U.S. Army Corps of Engineers (Hydrologic Simulation on Solid Waste Disposal Sites) has developed a computer model to estimate the amount of leachate generated by the movement of water through a multi-layered system similar to the one that is being discussed here. It has been demonstrated that such an impermeable cap is extremely efficient in diverting water away from the soil beneath it. On an average, 95 percent of the precipitation that falls on the area of infiltration-control would be diverted before it reaches the soil beneath the cover system.

The soil layers that are being contemplated for this alternative are much more stringent and thicker than the soil cap described in RAA2. Therefore, the quantity of leachate that is expected to be generated is negligibly less due to the soil-clay cap option proposed here.

Theoretically, the quantity of leachate to be treated would be the residual leachate that is captured within the site due to the construction of the cap. For all practical purposes, that water that is percolating through the landfill is assumed to be just enough to saturate the landfill wastes, but practically no excess leachate bleeds out; it is the excees leachate that normally bleeds out, and in this theoretical case, there would be no excess.

This frequently applied capping technology has demonstrated the ability to effectively eliminate infiltration and minimize subsequent leachate generation. Capping is perhaps the most consistently recommended remedial technology for waste disposal sites. Gas collection and venting are also reliable, remedial technologies.

Maintenance of this alternative is relatively minor and straightforward. O&M for RAA3 is considerably less than O&M for RAA2. Periodic inspection of the soil and vegetative cover and of the gas collection system will be required to ensure proper operation. Any problems resulting with the gas collection systems or the cover layer must be corrected. Post-closure, ground water monitoring, and analysis will also be required for this alternative.

Under this alternative it is not proposed to collect the leachate that may be given off by the waste material trapped under the RCRA cap. These wastes have a high moisture content, and would be expected to produce leachate for five to ten years. This leachate will be continuously discharging into the ground and or surface water. The discharge of leachate into surface water is not, however, through the surface run-off but leachate discharges into the Skippack Creek through ground water. All hydrogeological evidence indicates that the creek acts as a sink for the ground water from the landfill site. The impact of this leachate on ground water and surface water and other environmental and ecological receptors cannot be estimated at this time. Realistically, a major concern that remains is that the upper aquifer might be infiltrated laterally as well as vertically. If this is the case, the site will continue to generate leachate that could migrate into the lower aquifer through fractured bedrock. However, the implementation of this alternative does have the provision for ground water and surface water monitoring. This provision will assist in making an assessment if the environment is effected in the future.

Soil having permeability of less than 10^{-7} cm/sec. is not available in the vicinity of the site. The closest source for the clay is at a distance of more than 20 miles. This factor will significantly increase the cost of this alternative. However, the other major components and ancillary needs for contruction of a cap are obtainable close to the site. There are no internal site restrictions that would prevent a timely completion of this technology. Implementation of this alternative is more efficiently performed during dry weather and could be completed in a 6-month period from May to October. Scheduling of materials, labor, and equipment should be done so that they are available onsite when needed.

The capital costs of construction, annual operation and maintenance costs, present-worth of operation and maintenance costs for 30 years, and the total present-worth costs are presented in detail in the RI/FS. These cost-estiamtes incorporate the sensivity analysis for those items of work, the costs of which, are likely to vary during the implementation of this alternative. The capital costs of construction for the alternative vary from $16,777,700 to $20,506,000; the annual operation and maintenance costs vary from $222,300 to 271,700, and the total present worth costs, including present-worth costs for operation and maintenance for 30/5 years, vary from $18,290,100 to $22,354,400.

D. Alternatives that Exceed All Applicable Standards (RAA4)

This alternative contains all the provisions made in RAA3. It also proposes the following additional provisions under this alternative:

- Residual leachate will be collected, treated, discharged.

The residual leachate will be collected and treated in the same manner as the leachate generated, collected, and treated under Remedial Action Alternative 3. Additionally, included in this alternative is the collection of leachate from 0 to 30 feet and 0 to 60 feet. For the purposes of evaluation of this alternative and, more specifically, for the development of costs, the RAA4 will be divided as follows:

RAA4.1

- Miscellaneous work preparatory to installations of RCRA cap: grading, flattening of steep slopes, retaining walls and installations of rip-rap at the areas that are most likely to be eroded.
- Surface water collection and discharge to Skippack Creek
- Leachate collection between 0 to 30 feet depth and treatment at Moyer Landfill Site.

RAA4.2

- Same as RAA4.1 except the leachate shall be collected between 0 to 60 feet.

RAA4.3

- Same as RAA4.1 except the leachate will be treated at the Oaks Sewage Treatment Plant.

RAA4.4

- Same as RAA4.2 except that the leachate will be treated at the Oaks Sewage Treatment Plant.

RAA4.5

- Same as RAA4.1 except that the leachate will be treated at the Valley Forge Sewage Treatment Plant.

RAA4.6

- Same as RAA4.2 except that the leachate will be treated at the Valley Forge Sewage Treatment Plant.

In spite of the fact that interception of the maximum amount of leachate is proposed, (an estimated 80%), it may not be possible to collect all the leachate. However, some leachate will still percolate to ground water. Based on the findings of the RI, 2% of the uncaptured leachate would migrate vertically and the other 18% would discharge into the creek. Short-term ground and surface water monitoring might help assess the impact and also indicate any potential future monitoring.

Under this alternative, the leachate would be collected and treated to meet the 10-6 risk levels in the ground water and discharge requirements in the stream. This is estimated to take 5 years. Secondly, the quantity of leachate that is expected to be generated under alternative RAA4 is less than 50% of what would be generated under RAA2 (15,000 gpd vs. 30,000 gpd), unless the upper aquifer is being recharged laterally.

As pointed out under RAA3, soils having permeability of less than 10^{-7} cm/sec are not available in the vicinity of the site. The closest source of supply of the required cover material is at a distance of more than 20 miles. This will consequently greatly increase the cost of this alternative. However, the other major components and ancillary needs for construction of a cap are obtainable close to the site. There are no local site restrictions that would prevent a timely completion of this technology. Implementation of this alternative is most efficiently performed during dry weather and could be completed in a 6-month period from May to October. Scheduling of materials, labor, and equipment should be done so that they are available onsite when needed.

The public and environmental health benefit of this alternative has been discussed in RAA2.

The cap will comply with current RCRA requirements, which require that the cap should not be less permeable than the bottom of the landfill. The regulations also require elimination of ground water contamination, which this alternative addresses through residual leachate collection and treatment. As part of RCRA requirements for closure of existing land disposal facilities (part 265), RCRA provides that no synthetic liner is required if the unit does not have synthetic underliners to effectively control the quantities of leachate produced presently. Monitoring of ground water and surface water, leachate treatment, and maintenance of the cap would be part of the operations. This alternative exceeds all the institutional requirements, with no additional public or environmental benefits.

13.4.4.6 Cost

The capital costs of construction, annual operation and maintenance costs, present-worth of operation and maintenance costs for 30/5 years and the total present-worth cost are presented in detail in the RI/FS. These cost estimates incorporate the sensitivity analysis for those items of work, the costs of which are likely to vary during the implementation of this alternative. Depending upon the subalternative, the capital costs of construction will vary from $21,200,000 to $36,585,300, the annual operation and maintenance costs vary from $287,700 to $377,410, and the total present-worth costs including present-worth cost for operation and maintenance for thirty/five years, will vary from $23,912,500 to $40,153,100.

E. Alternatives that Specify Offsite Disposal (RAA5)

This alternative consists of constructing a new RCRA landfill site on an area of land adjacent and upstream of Moyer Landfill Site. The waste materials shall be excavated from the Moyer Landfill Site and disposed of at the new landfill site. The existing site shall be minimally graded and revegetated. Ground water and surface water monitoring programs as in other alternatives, shall also be implemented for a period of five (5) years.

The Moyer Landfill Site currently covers approximately 61 acres of which about 43.5 acres has been used for depositing waste materials. For all practical purposes, the wastes are assumed to be dumped randomly all over this 43.5 acres of land. The maximum elevation at the landfill is 493.5 feet. Different sectional views of the Moyer Landfill Site were drawn in order to compute the total volume of the material contained in the site. The volume of wastes buried on the site is computed to be approximately equal to 7.8 million cubic yards.

Placing these wastes into a new secure landfill involves excavation and hauling waste material from the Moyer Landfill to a nearby onsite RCRA-approved landfill. Contaminants would be released from the disturbed landfill through volatilization, which would lead to possible air pollution. The level of pollution will depend upon the location and the type of wastes buried at the site and climatic conditions during excavation and transport of wastes. Specialized construction/excavation techniques would have to be developed to minimize the amount of air pollution. The techniques under consideration are the use of a temporary liner over excavated portions of the landfill and covered trucks during any type of transportation. Excavation and hauling would take place 16 hours each day to minimize the length of time the material is to be exposed. The excavation of the fill can be accomplished with power shovels. If, during excavation, any saturated material is removed, it will be deposited on the road by draglines. This wet trash will be picked up and moved to a dewatering pad for subsequent disposal. Water from the dewatering pad will be conveyed and mixed with residual leachate that is otherwise being treated and discharged into Skippack Creek.

Long-term operation of an onsite disposal facility, such as the one described here, increases the risk of cancer, chronic health effects, and acute health effects to offsite receptors. This occurs becuase of the potential for emissions during storage of the waste, following excavation and prior to processing. A similar increase in risk to users of offsite surface water can be expected if discharges from the wastewater treatment plant exceed the applicable health and safety water quality criteria.

Excavation of the landfill poses the highest potential for deleterious environmental effects during the implementation of the alternatives previously discussed. The level of increased risk cannot be quantified. However, two major factors that tend to increase health risk and environmental damage under this alternative are:

- Construction activity will be more intense and of greater duration during any of the previous options,

- The concentrated waste will be exposed to the environment and handled routinely for a considerable length of time.

The capital costs of construction, annual operation and maintenance costs, present-worth of operation and maintenance costs for 30/5 years and the total present-worth cost are presented in detail in the RI/FS. These cost estimates incorporate the sensivity analysis for those items of work, the costs of which, are likely to vary during the implementation of this alternative.

Recommended Alternative(s)

Section 300.68(j) of the National Contingency Plan (NCP) [47 FR 31180; July 16, 1982] states that the appropriate extent of remedy shall be determined by the lead agency's selection of the remedial alternative which the agency determines is cost-effective (i.e., the lowest cost alternative that is technically feasible and reliable) and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, and the environment. In selecting a remedial alternative EPA considers all environmental laws that are applicable and relevant.

Receiver's Remedial Action Alternative

Based on the evaluation of the proposed alternatives, the comments received from the public, information from the Feasibility Study and information from PADER, the Receiver's Remedial Action Alternative (RRAA) can be implemented at the Moyer Landfill Site. This phased remedy will satisfy all of the contamination objectives identified in the Remedial Investigation at the point of closure (10 to 20 years).

The proposed gas recovery system will collect, clean and upgrade the methane gas generated in the Landfill instead of venting it to the atmosphere and provide energy for the operation of the leachate treatment plant. The receiver will receive royalties from the sale of the gas to PECO which will be applied toward the overall closure cost.

The leachate collection system and treatment plant will eliminate the offsite migration of untreated leachate into adjacent surface waters.

The placement of a soil cover with a permeability of $10^{-4}/10^{-5}$ cm/sec. will allow the most efficient recovery of methane gas, and still reduce the generation of leachate to be collected and treated. At the conclusion of the gas recovery program the RRAA provides for the construction of an additional cap which will meet RCRA standards. The ground water monitoring program will assure that necessary environmental standards are met.

It is contemplated by the RRAA that capital financing costs for the leachate collection system and treatment plant, soil cap, soil erosion program, security and fencing, the methane gas recovery facilities and all other related capital expenditures will be financed through limited partnership investment, bank financing and other capital contributions. Operating and maintenance costs relating to the methane gas recovery system (exclusive of those costs relating to the hazardous waste aspect of such O&M) will be paid out of gross revenues generated from the production and sale of methane gas at the facility. Operating and maintenance costs for the leachate collection and treatment system and other related costs including maintenance of the soil cap, a portion of security and fencing, debt and/or lease rental payments relating thereto will be paid for by the PRPS and out of royalty payments due the receiver from the methane gas recovery program.

Capital investment for the methane gas recovery program, expected to range from approximately $2 million and $2.5 million, will be at risk with payment subject to the ability of the project to generate pipeline quality gas for delivery to PECO pursuant to the contract betwen ERP and PECO.

Revenues generated pursuant to the PECO contract are based upon the amount of gas sold to PECO, paid for at the rate of 90% of the then current Transco gas pipeline tariff. At the present, said tariff is $3.55 per 1000 cubic feet of gas. ERP estimates that tariffs in effect at the time of initial gas production in early 1986 will remain at such level until 1987. Thereafter, annual price increases of 5% are estimated.

It is anticipated that these gross revenues will be sufficient to cover operating and maintenance expenses for the methane gas recovery program, enable ERP to make necessary debt service payments and to prove a fair return to its investors.

Capital expenses for the non-methane gas recovery portions of the RRAA base cost is to be $3,425,500 million. Debt service on these amounts, and operating and maintenance cost relating thereto will be paid for by the PRPS pursuant to a closure agreement that provides security sufficient to assure that required payments will be made.

The security for such payments may include, provision of operating and debt service reserve funds, letters of credit, or corporate guarantees as appropriate under the circumstances.

To the extent that the receiver's interim remedial measures are insufficient to accomplish the permanent closure of the site in accordance with applicable environmental standards, the RRAA includes provision that the PRPS will furnish such additional funds as may be necessary to close the site consistent with the remedial action alternative described below and will post a bond or other security sufficient in amount to make necessary additions and alterations to the existing interim remedial measures so as to permanently close the site.

The above financing program contemplates initiation of design and construction of the facilities on a fast track basis which will allow the methane gas generation system to be in operation in early 1986 and the leachate treatment facilities to be operational by the summer of 1986.

The RRAA defines the full scope of remedial work to be performed in the immediate future. It contemplates broad remedial work and its implementation will depend upon the success of the gas generation/recovery program and the contributions from generators and other potentially responsible parties (PRP). The gases generated at the Moyer Landfill site are most likely to contain trace amounts of toxic volatiles and gases; the gas will be cleaned to pipeline quality and toxics, if any, will be properly disposed. The economic viability and public acceptability of the gas recovery program is a proven concept in present practice in other parts of the U.S. As proposed, this program will meet the NCP criteria of a corrective action planned for a hazardous waste site. The contamination at Moyer Landfill site requires remediation to mitigate the public health and environmental concerns; the gas recovery program will address and remediate the concerns.

If negotiations with the PRPs fail and/or the methane gas generation/recovery program fails, we recommend Remedial Action Alternative 4 with a modification to the cap, be implemented at the Moyer Landfill Site. This remedy will satisfy as well all of the contamination objectives identified in the Remedial Investigation.

Alternative 4

The modified Alternative 4 meets all federal standards. It consists of a 10^{-7} RCRA cap without the synthetic liner, with surface water collection and discharge, leachate collection(ranging between 0-60 feet) and treatment, gas venting and ground water and surface water monitoring. The cap originally proposed in RAA4 does not provide any additional health or environmental benefits, exceeds all standards, requires a longer construction period and is not as costeffective as the proposed 10^{-7} RCRA cap. In addition, the leachate collection system will be designed to meet the 10^{-6} risk level in the ground water and discharge requirements in the streams. The depth could vary anywhere from 0 to 60 feet.

In spite of the fact that interception of the maximum amount of leachate is proposed, it may not be possible to collect all the leachate. Some leachate will still percolate to ground water and also probably, to a certain extent, through the ground water to the surface water. However, the quantities of leachate will be so minimal that their exact impact could not be predicted at this time. Short-term ground and surface water monitoring might help assess the impact and also indicate any potential future monitoring.

The cap will comply with current RCRA requirements, which require that the cap should not be less permeable than the bottom of the landfill. The regulations also require elimination of ground water contamination, which this alternative addresses through residual leachate collection and treatment. As part of the RCRA requirements for closure of existing land disposal facilities (Part 265), RCRA provides that no synthetic liner is required if the unit does not have synthetic underliners to effectively control the quantities of leachate produced presently. Monitoring of ground water and surface water, leachate treatment, and maintenance of the cap would be part of the operations.

The capital costs of construction and annual operation and maintenance costs are as follows:

1.	Soil/Clay 10^{-7} Cap *	$9,308,400
2.	Run Off Collection and Discharge	330,000
3.	Gas Vent System	331,800
4.	Access Road for Maintenance Purpose	108,000
5.	Leachate Collection **	4,650,000
6.	Leachate Treatment	656,600
	Total Capital Costs	$15,384,800
	Annual Operation and Maintenance	343,100

* This cap does not include a 20 mil. synthetic liner.

** Design parameters which directly affect the size of the system and quantities of the materials required influence costs. Trench depth is the most cost-influencing factor. The exact depth of the collection system will be based on coring results developed in the Design Phase and a fate and transport model to determine the amount of leachate that needs to be treated to maintain discharge requirement levels into the Skippack Creek and 10^{-6} risk levels in ground water.

Operations and Maintenance

Monitoring and Post-Closure Maintenance activities are required to verify the site cleanup, effectively maintain permanent onsite actions, monitor potential contaminant migration. Detailed costs are itemized in Volume I Section 13 of the Remedial Investigation/Feasibility Study. All samples taken will be analyzed for Hazardous Substance List (HSL) parameters.

Schedule for Alternative 4

Approve Remedial Action (Sign ROD)	9/30/85
Negotiations with PRP Conclude	11/30/85

Start Design	12/30/85
Complete Design	8/30/86
Start Construction	9/30/86

Evaluation of Alternatives Not Selected

The No-Action with Monitoring alternative was not selected since soil, sediment, and surface water contamination will continue to pose a direct contact threat to human health and the environment. There would be a continued migration of contaminants to the ground water, surface water and release to the air.

Alternative 2 and subcomponents meet CERCLA goals but fall short of providing full protection from contamination of shallow ground water. The soil cover will still allow leachate generation and subsequent contamination of the ground water. O&M will be more expensive than O&M in Alternative 4. Permits were unobtainable for offsite treatment.

Alternative 3 satisfies all applicable standards, reduces further contamination by stopping the generation of fresh leachate. However, it does not provide for the collection, treatment and disposal of residual leachate that is trapped under the impermeable cover.

Alternative 5 was not chosen due to extremely high costs, difficulty in implementing, safety concerns and lengthy construction duration of 10 to 20 years.

Consistency with Other Environmental Laws

EPA is currently proposing regulations requiring the agency to select a remedial Superfund remedy which "...attains or exceeds applicable or relevant Federal public health or environmental standards." See proposed 40 C.F.R. §300.68(f).

Environmental laws which may be applicable or relevant to remedial activity are:

- National Environmental Policy Act (NEPA)
- Clean Air Act (CAA)
- Clean Water Act (CWA)
- Safe Drinking Water Act (SDWA)
- Resource Conservation and Recovery Act (RCRA)

- Pennsylvania Clean Streams Act
- Toxic Substances Control Act (TSCA)

These two chosen alternatives meet NEPA functional equivalency exception because the necessary and appropriate investigation and analysis of environmental factors as they specifically relate to the Moyer Landfill Site. In addition, a meaningful opportunity for public comment on environmental issues was provided before the final selection of the remedial alternatives were made.

Compliance with all substantive requirements of the CWA and CAA as well as the Pennsylvania Clean Streams Act will be incorporated into the design of the remedial alternatives. Any discharge into the atmosphere of gas will be monitored to assure all applicable standards are not exceeded. Discharge of treated surface water will comply with appropriate standards. The cap chosen will meet all of the RCRA requirements under 40 C.F.R. §264.310.

MOYER LANDFILL RESPONSIVENESS SUMMARY

INTRODUCTION

The preferred alternatives as described in this ROD generally are supported by the local community and its leaders. Both residents and public officials are frustrated by the duration of the RI/FS process, and the relative expediency of the receiver's proposal is seen as its most desireable feature. The community also has voiced concern that EPA's "fall back alternative" be ready for implementation if the receiver's proposal fails in some way. The only substantive change in the ROD process as a result of community input was an extention of the comment period from September 18 to September 23.

COMMUNITY INVOLVEMENT HISTORY

According to available information, the first three decades of Moyer Landfill history were marked by minimal community interest. However, in 1977, when the operators of the landfill sought to expand the site from 44 acres to 185 acres, residents in the vicinity of the landfill joined together and formed a group called the Lower Providence Concerned Citizens (LPCC) to fight the expansion plans. In addition to stopping the growth of Moyer Landfill, the LPCC demanded that the existing site be closed.

LPCC concern over what was perceived as the PADER indifference to citizen's complaints, and to obvious violations of State and Federal environmental laws at the Moyer Landfill Site, led to the filing of a civil suit in Federal court in June 1980. The LPCC was joined in this effort by approximately 100 individuals and several local civic and sportsmen's groups, including the League of Women Voters of the Valley Forge (Pennsylvania) area, the Valley Forge Audubon Society, and the Country Boy Bass Association. The original suit named the PADER, as well as the owners and operators of Moyer Landfill, Inc., as defendants; but the suit was dismissed. Later, a combined suit was filed by the citizens and organizations mentioned above and the PADER against the owners and operators of Moyer Landfill, Inc.

Although the early years of LPCC existence were marked by difficulties with local government, the organization and other residents are pleased with the present elected officials and report a good working relationship with them. The community's relationship with the PADER can be characterized as cautious. Local officials and residents were satisfied when the EPA began investigating the Moyer Landfill Site, but both groups are unsatisfied with the duration of the RI/FS process and have demanded effective clean up action as soon as possible.

COMMENT SUMMARY

This section is divided into two parts:

I. Remarks and issues voiced during a September 10 public meeting.

II. Other remarks and issues concerning the Moyer Landfill site including those raised during a September 10 briefing with Township representatives.

I. A public meeting was held at 7:00 p.m. on September 10, 1985, at the Lower Providence Township Municipal Building in Lower Providence Township, Pennsylvania. The purpose of the meeting was to discuss, with interested parties, the results of the Remedial Investigation (RI)/Feasibility Study (FS) conducted by EPA at the Moyer Landfill site, and to request comments from the public concerning the cleanup alternatives presented in the FS.

There were approximatley 40 individuals in the audience including representatives from the local newspaper and television station, various state agencies, contractors who have been involved in site work, the U.S. EPA, and interested citizens.

Officials hosting the meeting included Tom Voltaggio, Chief of the Superfund Branch of EPA; Greg Crystall, member of the enforcement section of EPA; Stephanie Del Re, site project officer of EPA; Ray Germann, Community Relations Specialist of EPA, Don Becker, from the Pennsylvania Department of Environmental Resources (PADER); Joanne Denworth, court receiver for the Moyer Landfill; and Fred Ehmann, representing Energy Recovery Partners.

Attached is a summary of issues and questions raised during the meeting, and the responses given by EPA.

Public and Environmental Health

ISSUE: A number of questions pertained to the nature and extent of contamination at the site. Several citizens wanted to know what health risks contamination (i.e., radiation) from the site posed to them.

RESPONSE: The remedial investigation report defines the nature and extent of contamination at the site. Radiation levels detected offsite were below drinking water standards. The main problem at the site is the heavy metals and volatile organics found in the leachate that is flowing offsite into Skippack Creek. The court receiver's remedial alternative would adequately address the leachate problem.

ISSUE: Several citizens expressed concern that leachate is entering the shallow groundwater and contaminating their wells.

RESPONSE: Most of the leachate is flowing into Skippack Creek via groundwater and seeps. The rock formation separating the upper and lower aquifers is very tight and residential wells are drilled below the rock formation. There is very little seepage of leachate through the rock formation and therefore little danger of residential well contamination near the site.

ISSUE: Several citizens were concerned about leachate flowing into the Skippack Creek. They wanted to know what kind of damage this leachate could be causing to the creek, fish in the creek, and children playing near the creek.

RESPONSE: EPA has conducted extensive testing of Skippack Creek and has found only low levels of contamination in the water and in fish. EPA acknowledges that leachate flowing into Skippack Creek is a major problem at the site. The recommended remedial alternative will provide for collection and treatment of leachate entering the creek.

ISSUE: A citizen reported that periodically large trucks drive up towards the site area at night and return a short time later. Is dumping still occurring at the site?

RESPONSE: The landfill is closed. Dumping has been reported on areas adjacent to the site. Any specific information on illegal dumping should be passed on to the EPA.

ISSUE: A few citizens were concerned that the proposed gas line from the landfill would damage their property.

RESPONSE:* The gas company will negotiate to buy private right-of-ways and if this is unsuccessful, then the public right-of-way will be used. No residents will be forced to accept the gas line through their property.

EPA Cleanup Process

ISSUE: Several citizens wanted to know why many studies have been conducted at the site over the years but nothing has been done to stop the flow of leachate from the site. Citizens wanted to know a definitive date when site cleanup would begin.

RESPONSE: Studies are lengthy but are required to accurately define the nature and extent of contamination at the site. Information from the RI/FS and hydrogeological assessment conducted at the site will be carefully evaluated by EPA so it can select a cleanup alternative that is environmentally sound and cost-effective. EPA is anxious to begin cleanup work at the site and encourages public comment on the various cleanup alternatives. EPA will decide on the cleanup alternative by the end of the month.

ISSUE: A citizen wanted to know if the people who are responsible for contaminating the site will clean up the site.

RESPONSE: The responsible parties should definitely play a role in cleanup at the site. The court receiver's plan would provide for this by making generators a financial party in any cleanup agreement. At least 28 potentially responsible parties have been contacted by EPA. If anyone has additional documentation of other potentially responsbile parties, EPA would like to have this information.

ISSUE: A citizen expressed concern whether funding was available to clean up the site.

RESPONSE: EPA will likely sign the record of decision (ROD) at the end of the month. At that time, potentially responsible parties (PRPs) have 60 days to enter into an agreement with EPA to help clean up the site. After this 60 day period, funding is either made available from PRPs or from EPA if no agreement is made. This means that funding for site cleanup should be available in late November. This schedule assumes that Congress passes a new Superfund bill presently under debate in Congress.

ISSUE: Several citizens stated that they wanted to be informed of cleanup progress at the site.

RESPONSE: EPA will meet with concerned citizens again in October to inform them of progress and plans and to address additional concerns. The court receiver also emphasized that citizen participation is very important in the cleanup process.

ISSUE: A representative of some of the PRP, wanted to have the comment period extended to have adequate time to comment on the RI/FS.

RESPONSE: The comment period will be extended until September 23.

ISSUE: A citizen expressed the opinion that star wars and the Pentagon is preventing the Government from adequately protecting the public air and water. The individual suggested that cost should not be a consideration in site cleanup.

RESPONSE: None

<u>Technical</u>

ISSUE: A citizen who lives north and west of the landfill near Eagle Stream wanted to know why his well had not been tested.

RESPONSE: EPA will investigate this possibility but it is likely that the well has been tested and EPA can find the results in the RI/FS document.

ISSUE: A citizen expressed concern that methane gas will cause the clay cap to crack.

RESPONSE: There will be continuous maintenance of the clay cap.

ISSUE: A citizen was concerned that leakage will slowly occur from the upper aquifer into the lower aquifer. Have recovery wells been considered to withdraw contaminated groundwater and to prevent seepage into the lower aquifer?

RESPONSE: The leachate collection system and RCRA cap will capture most of the leachate and monitoring will continue to provide information on conditions in the lower aquifer. Recovery wells were not considered cost-effective or necessary.

Remedial Action Alternatives

ISSUE: A citizen wanted to know what will happen if the court receiver's alternative fails due to a lack of cooperation from potentially responsible parties.

RESPONSE: EPA has a preferred "fall back" alternative which provides for a site cap, leachate collection and treatment, gas venting and monitoring. If the court receiver's alternative fails, for whatever reason, EPA would implement the "fall back" alternative.

ISSUE: A citizen was concerned that EPA's 'fall back" alternative was dangerous because capping would trap the methane gas.

RESPONSE: EPA's preferred "fall back" alternative includes a provision for venting methane gas to stop any dangerous build-up of gas and to prevent damage to the cap.

ISSUE: A citizen wanted to know what will be done to collect the leachate seeps in Evansburg State Park.

RESPONSE: The selected alternative will provide for collection of leachate from all major sources of generation.

ISSUE: A citizen inquired whether EPA had accepted the court receiver's alternative.

RESPONSE: EPA prefers the court receiver's alternative but has not accepted it. Public comment is required prior to making a decision. Public comments are strongly encouraged by EPA during the cleanup process.

ISSUE: A citizen wanted to know what would happen if something went wrong after the court receiver's alternative had been implemented and suddenly money was not available for site cleanup.

RESPONSE: EPA requires that there be enough financial backing behind the cleanup plan so that if something goes wrong there is still enough money to close the site as required under EPA guidelines.

ISSUE: Several citizens expressed a favorable opinion regarding the alternative presented by the court receiver, but wanted to know when the remedial action could begin.

RESPONSE:* If EPA approves the alternative, final closure and cleanup plans could begin immediately. The facilities could be built and put into operation by late spring. EPA officials emphasized that the court receiver's alternative would allow cleanup to begin sooner than allowed under EPA's alternative.

* The response to the comment was made by Joanne Denworth, court receiver for the Moyer Landfill.

II. This section addresses past and present issues not already included in the meeting summary.

ISSUE: A Township official was concerned that EPA's plans for cleanup were not more specific, and that we did not already have specific plans for the preferred alternative.

RESPONSE: EPA and/or the receiver will draw up specifications and begin design after the comment period closes and a ROD is written. The FS process outlines concepts, but does not draw up specifications.

ISSUE: A local land owner suggested creating a lined landfill adjacent to the current site and requiring that, for each ton of new waste deposited in the lined landfill, the owner be required to accept one ton from the Moyer landfill, eventually transferring the entire Moyer landfill into a lined facility.

RESPONSE: A variation of this suggestion is included as an option in the FS. It would include total excavation over a term of 5-15 years, and encounter strong resistance from local residents.

ISSUE: Potentially responsible parties were not given adequate time to comment on the RI/FS prior to development of the ROD.

RESPONSE: The RI/FS was received by PRPs July 24. The comment period ended Sept. 23. The National Contingency Plan (NCP) calls for a 30-day comment period on the RI/FS before a cleanup alternative is chosen.

ISSUE: The information obtained to date shows that the actual environmental impact that has occurred and the potential for future impacts do not represent any imminent danger to the environment or human health and safety near the Moyer Landfill. Also, there are several areas in which the data base and analysis are insufficient.

RESPONSE: While the evidence suggests that there has been little or no impact upon public health or the environment from site contamination to date, the continued flow of contaminated leachate from the landfill may pose a future threat to public health or the environment. This possibility is sufficient to justify remedial action under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and the National Contingency Plan (NCP). EPA considers the sampling plan and protocol outlined in the RI sufficient to accurately gauge potential risks posed by the site.

ISSUE: The RI/FS evaluates a number of remedial action alternatives. In general, the environmental benefits which may be obtained from their implementation have not been identified or weighed against the risk of potential harm suggested in the RI or against any risks which may be presented by the alternatives themselves. Should a comprehensive risk assessment be conducted, it is likely that is would identify either RAA-1 or RAA-2 as the measures most consistent with the NCP.

RESPONSE: As outlined in the FS, either of the preferred alternatives will adequately address the flow of leachate off site, thereby eliminating the future risk to public health or the environment. EPA believes that the provisions in the preferred alternatives provide cleanup benefits superior to those included in other remedial action alternatives.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
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Bureau of Solid Waste Management

717-783-7816

September 27, 1985

United States Environmental
Protection Agency
Region III
841 Chestnut Building
Philadelphia, PA 19107

Attention: Thomas C. Voltaggio, Chief
Superfund Branch

Re: Moyers Landfill Superfund Site
Lower Providence Township
Montgomery County

Dear Mr. Voltaggio:

This letter constitutes our response to the Remedial Alternative Selection Summary for the Moyer Landfill, which we received on September 26, 1985. It is the Department's position that government funds should not be utilized for remedial action projects when other monies are readily available to be used for such purposes. This enables an agency to reserve funds for cleanup situations when no other sources of relief are provided. In the Moyer Landfill case, we concur with EPA on the recommended receivers Remedial Action Alternative (RRAA), as discussed on pages 24 through 28 of summary. As a precaution, EPA proposes to resort to Alternative 4 in event that the methane gas recovery program does not materialize, or fails to accomplish the required remedial work.

This office strongly recommends that individuals who propose to undertake the gas recovery program provide ample bond to assure that all the remedial work can occur. A proposed schedule with remedial design phases concomitant with the progress of the methane recovery program should be prepared first. EPA should then consider entering into a binding legal agreement with the PRPs to ensure their commitment to satisfy the entire scope of the remedial action, and to perform Operations and Maintenance at the site for 30 years.

We hope that all future activities at the Moyer Landfill will develop to everyone's satisfaction, and especially to the improvement of the environment.

Very truly yours,

Dwight D. Worley

Dwight D. Worley, Chief
Division of Emergency and Remedial Response